AQA GCSE MATHEMATICS

HIGHER TIER

UNIT 6: STATISTICS PRACTICE BOOK

Modules 1-10 | 450 original questions | Formula guides, full methods and marking guidance

FREE WEBSITE EDITION

Student name: _____

Target grade: _____ Start date: _____ Completion date: _____

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MODULE 01 / S1-S6

Unit 6 Contents and Study Plan

MODULES 1-10 • FREE WEBSITE EDITION

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Begin with the short fluency check, then move through Standard Higher, Multi-step Higher and Grade 7-9 Challenge. Formula guides and all worked answers are collected at the end.

Book structure

- 8 purposeful fluency questions per module
- 12 Standard Higher questions per module
- 15 multi-step Higher exam questions per module
- 10 Grade 7-9 challenge questions per module
- Formula and method bank for every module
- All answers, formulas and worked methods at the end

MODULE 01 / S1-S6

Unit 6 Specification and Paper Review

EVIDENCE-INFORMED AUTHORING MAP

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

All questions are independently authored. The current AQA 8300 Statistics specification and recurring Higher-paper structures informed representation choice, mark demand, interpretation and multi-stage problem solving; no past-paper wording or numerical data are reproduced.

Source	Specification / paper	Design guidance
M1	S1,S5	Sampling, Data Collection, Bias and Population Inference
M2	S4	Averages, Quartiles, Spread, Outliers and Algebra
M3	S2,S4	Frequency Tables, Grouped Data and Estimated Means
M4	S2,S4	Statistical Diagrams, Time Series and Misleading Graphs
M5	S3,S4	Cumulative Frequency, Quartiles and Box Plots
M6	S3,S4	Histograms and Frequency Density
M7	S6	Scatter Graphs, Correlation, Best Fit and Prediction
M8	S4,S5	Comparing Distributions, Skew and Statistical Conclusions
M9	S1,S2,S4,S5	Missing Data, Corrections, Critique and Statistical Validity
M10	S1-S6 synthesis	Mixed Higher Statistics Problem Solving
2017-2019	Papers 1H-3H	early series: sampling, charts, grouped data and comparison
2022-2025	Papers 1H-3H	recent series: histograms, cumulative frequency, critique and inference

Review scope: summer Higher papers from 2017-2019 and 2022-2025. Summer examinations were cancelled in 2020 and 2021.

MODULE 01 / S1-S6

How to Use and Check Your Work

STUDENT ROUTINE AND QUALITY STANDARD

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

1 Attempt Work without notes first. Choose an appropriate table, chart or diagram before calculating, and identify what each variable represents.

2 Mark Use the worked answer. Credit a method only when its mathematical setup is visible.

3 Repair Identify whether the error was modelling, units, algebra, arithmetic or interpretation; then redo from blank.

4 Retest Repeat a similar question after 2-7 days without support.

5 Present Give exact values where appropriate, sensible accuracy, units and a concluding statement.

Higher answer standard

- Define the variables and governing relationship
- Compare centre and spread separately, using values from the data
- Interpret every result in context and do not claim causation from correlation
- For comparisons, quote statistics and describe what they show about the distributions
- Check estimates, graph readings and conclusions are statistically reasonable

MODULE 01 / S1,S5

Sampling, Data Collection, Bias and Population Inference

FLUENCY CHECK

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

A short prerequisite check. Work accurately, then move promptly to Higher demand.

1. A population has 800 members. Describe a simple random sample of 40. [U6-M01-Q01] [3 marks]

2. A school samples every 11th name after a random start. Name the method and give one possible limitation. [U6-M01-Q02] [3 marks]

3. A population has groups of sizes 210, 308 and 506. Find the proportional allocation for a sample of 120. [U6-M01-Q03] [4 marks]

4. A researcher surveys users leaving one gym at 10 am to estimate national exercise habits. Identify two sources of bias (case 4). [U6-M01-Q04] [3 marks]

5. Write an unbiased questionnaire item to investigate weekly screen time, with suitable response categories (variant 5). [U6-M01-Q05] [4 marks]

6. A sample of 50 gives a mean of 23. Estimate the population total for 1050 members and state a limitation. [U6-M01-Q06] [4 marks]

7. Compare primary and secondary data for a study of travel times (case 7). [U6-M01-Q07] [4 marks]

8. Explain why a large sample can still give a misleading population estimate (case 8). [U6-M01-Q08] **[4 marks]**

MODULE 01 / S1,S5

Sampling, Data Collection, Bias and Population Inference

STANDARD HIGHER • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Higher-tier application. Show the governing relationship and exact working.

1. A population has 1200 members. Describe a simple random sample of 56. [U6-M01-Q09] [3 marks]

2. A school samples every 11th name after a random start. Name the method and give one possible limitation. [U6-M01-Q10] [3 marks]

3. A population has groups of sizes 250, 340 and 530. Find the proportional allocation for a sample of 100. [U6-M01-Q11] [4 marks]

4. A researcher surveys users leaving one gym at 10 am to estimate national exercise habits. Identify two sources of bias (case 12). [U6-M01-Q12] [3 marks]

5. Write an unbiased questionnaire item to investigate weekly screen time, with suitable response categories (variant 13). [U6-M01-Q13] [4 marks]

6. A sample of 66 gives a mean of 22. Estimate the population total for 1450 members and state a limitation. [U6-M01-Q14] [4 marks]

MODULE 01 / S1,S5

Sampling, Data Collection, Bias and Population Inference

STANDARD HIGHER • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Continue the Higher set. Interpret each result in context.

7. **Compare primary and secondary data for a study of travel times (case 15). [U6-M01-Q15]** **[4 marks]**

8. **Explain why a large sample can still give a misleading population estimate (case 16). [U6-M01-Q16]** **[4 marks]**

9. **A population has 1600 members. Describe a simple random sample of 72. [U6-M01-Q17]** **[3 marks]**

10. **A school samples every 11th name after a random start. Name the method and give one possible limitation. [U6-M01-Q18]** **[3 marks]**

11. **A population has groups of sizes 290, 372 and 554. Find the proportional allocation for a sample of 130. [U6-M01-Q19]** **[4 marks]**

12. **A researcher surveys users leaving one gym at 10 am to estimate national exercise habits. Identify two sources of bias (case 20). [U6-M01-Q20]** **[3 marks]**

MODULE 01 / S1,S5

Sampling, Data Collection, Bias and Population Inference

MULTI-STEP HIGHER • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Original multi-step exam-style questions. Show every connected stage.

1. Write an unbiased questionnaire item to investigate weekly screen time, with suitable response categories (variant 21). [U6-M01-Q21] **[4 marks]**

2. A sample of 82 gives a mean of 21. Estimate the population total for 1850 members and state a limitation. [U6-M01-Q22] **[4 marks]**

3. Compare primary and secondary data for a study of travel times (case 23). [U6-M01-Q23] **[4 marks]**

4. Explain why a large sample can still give a misleading population estimate (case 24). [U6-M01-Q24] **[4 marks]**

5. A population has 2000 members. Describe a simple random sample of 88. [U6-M01-Q25] **[3 marks]**

MODULE 01 / S1,S5

Sampling, Data Collection, Bias and Population Inference

MULTI-STEP HIGHER • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Continue the multi-step set. Explain decisions where requested.

6. **A school samples every 11th name after a random start. Name the method and give one possible limitation. [U6-M01-Q26]** **[3 marks]**

7. **A population has groups of sizes 330, 404 and 578. Find the proportional allocation for a sample of 110. [U6-M01-Q27]** **[4 marks]**

8. **A researcher surveys users leaving one gym at 10 am to estimate national exercise habits. Identify two sources of bias (case 28). [U6-M01-Q28]** **[3 marks]**

9. **Write an unbiased questionnaire item to investigate weekly screen time, with suitable response categories (variant 29). [U6-M01-Q29]** **[4 marks]**

10. **A sample of 98 gives a mean of 20. Estimate the population total for 2250 members and state a limitation. [U6-M01-Q30]** **[4 marks]**

MODULE 01 / S1,S5

Sampling, Data Collection, Bias and Population Inference

MULTI-STEP HIGHER • PART C

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Complete the multi-step set. Check units, accuracy and reasonableness.

11. **Compare primary and secondary data for a study of travel times (case 31). [U6-M01-Q31]** **[4 marks]**

12. **Explain why a large sample can still give a misleading population estimate (case 32). [U6-M01-Q32]** **[4 marks]**

13. **A population has 2400 members. Describe a simple random sample of 104. [U6-M01-Q33]** **[3 marks]**

14. **A school samples every 11th name after a random start. Name the method and give one possible limitation. [U6-M01-Q34]** **[3 marks]**

15. **A population has groups of sizes 370, 436 and 602. Find the proportional allocation for a sample of 140. [U6-M01-Q35]** **[4 marks]**

MODULE 01 / S1,S5

Sampling, Data Collection, Bias and Population Inference

GRADE 7-9 CHALLENGE • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Extended reasoning. Plan the model before calculating.

1. A researcher surveys users leaving one gym at 10 am to estimate national exercise habits. Identify two sources of bias (case 36). [U6-M01-Q36] [3 marks]

2. Write an unbiased questionnaire item to investigate weekly screen time, with suitable response categories (variant 37). [U6-M01-Q37] [4 marks]

3. A sample of 114 gives a mean of 19. Estimate the population total for 2650 members and state a limitation. [U6-M01-Q38] [4 marks]

4. Compare primary and secondary data for a study of travel times (case 39). [U6-M01-Q39] [4 marks]

5. Explain why a large sample can still give a misleading population estimate (case 40). [U6-M01-Q40] [4 marks]

MODULE 01 / S1,S5

Sampling, Data Collection, Bias and Population Inference

GRADE 7-9 CHALLENGE • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Complete the challenge set. Present a clear mathematical argument.

6. **A population has 2800 members. Describe a simple random sample of 120. [U6-M01-Q41]** **[3 marks]**

7. **A school samples every 11th name after a random start. Name the method and give one possible limitation. [U6-M01-Q42]** **[3 marks]**

8. **A population has groups of sizes 410, 468 and 626. Find the proportional allocation for a sample of 120. [U6-M01-Q43]** **[4 marks]**

9. **A researcher surveys users leaving one gym at 10 am to estimate national exercise habits. Identify two sources of bias (case 44). [U6-M01-Q44]** **[3 marks]**

10. **Write an unbiased questionnaire item to investigate weekly screen time, with suitable response categories (variant 45). [U6-M01-Q45]** **[4 marks]**

MODULE 02 / S4

Averages, Quartiles, Spread, Outliers and Algebra

FLUENCY CHECK

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

A short prerequisite check. Work accurately, then move promptly to Higher demand.

1. For the data [4, 7, 9, 12, 15, 18], find the mean and range. [U6-M02-Q01] [2 marks]

2. The mean of 9 values is 13. Find their total. [U6-M02-Q02] [2 marks]

3. The mean of 12 values is 22. One value 37 is removed. Find the new mean. [U6-M02-Q03] [4 marks]

4. A data set has lower quartile 15, median 23, upper quartile 34. Find the IQR and interpret it. [U6-M02-Q04] [3 marks]

5. A data set has Q1=14, Q3=34. Use the 1.5×IQR rule to give outlier fences. [U6-M02-Q05] [4 marks]

6. Two groups have means 65 and 70, with sizes 25 and 35. Find the combined mean. [U6-M02-Q06] [4 marks]

7. The mean of x, x+2, 2x-1 and 11 is 10. Find x. [U6-M02-Q07] [4 marks]

8. Explain why median and IQR may be preferred to mean and range for skewed data with outliers (case 8). [U6-M02-Q08] [4 marks]

MODULE 02 / S4

Averages, Quartiles, Spread, Outliers and Algebra

STANDARD HIGHER • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Higher-tier application. Show the governing relationship and exact working.

1. A set has n values and mean m. Every value is transformed to 3x-5. Prove the new mean is 3m-5 (case 9). [U6-M02-Q09] [5 marks]

2. For the data [8, 10, 10, 14, 15, 22], find the mean and range. [U6-M02-Q10] [2 marks]

3. The mean of 11 values is 13. Find their total. [U6-M02-Q11] [2 marks]

4. The mean of 11 values is 25. One value 46 is removed. Find the new mean. [U6-M02-Q12] [4 marks]

5. A data set has lower quartile 14, median 25, upper quartile 31. Find the IQR and interpret it. [U6-M02-Q13] [3 marks]

6. A data set has Q1=11, Q3=35. Use the 1.5×IQR rule to give outlier fences. [U6-M02-Q14] [4 marks]

MODULE 02 / S4

Averages, Quartiles, Spread, Outliers and Algebra

STANDARD HIGHER • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Continue the Higher set. Interpret each result in context.

7. **Two groups have means 66 and 74, with sizes 20 and 35. Find the combined mean. [U6-M02-Q15]** [4 marks]

8. **The mean of x, x+2, 2x-1 and 10 is 11. Find x. [U6-M02-Q16]** [4 marks]

9. **Explain why median and IQR may be preferred to mean and range for skewed data with outliers (case 17). [U6-M02-Q17]** [4 marks]

10. **A set has n values and mean m. Every value is transformed to 3x-5. Prove the new mean is 3m-5 (case 18). [U6-M02-Q18]** [5 marks]

11. **For the data [7, 7, 11, 16, 15, 21], find the mean and range. [U6-M02-Q19]** [2 marks]

12. **The mean of 13 values is 13. Find their total. [U6-M02-Q20]** [2 marks]

MODULE 02 / S4

Averages, Quartiles, Spread, Outliers and Algebra

MULTI-STEP HIGHER • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Original multi-step exam-style questions. Show every connected stage.

1. The mean of 10 values is 22. One value 55 is removed. Find the new mean. [U6-M02-Q21] [4 marks]

2. A data set has lower quartile 13, median 20, upper quartile 34. Find the IQR and interpret it. [U6-M02-Q22] [3 marks]

3. A data set has Q1=14, Q3=36. Use the 1.5×IQR rule to give outlier fences. [U6-M02-Q23] [4 marks]

4. Two groups have means 67 and 73, with sizes 22 and 35. Find the combined mean. [U6-M02-Q24] [4 marks]

5. The mean of x, x+2, 2x-1 and 14 is 8. Find x. [U6-M02-Q25] [4 marks]

MODULE 02 / S4

Averages, Quartiles, Spread, Outliers and Algebra

MULTI-STEP HIGHER • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Continue the multi-step set. Explain decisions where requested.

6. Explain why median and IQR may be preferred to mean and range for skewed data with outliers (case 26). [U6-M02-Q26] [4 marks]

7. A set has n values and mean m. Every value is transformed to 3x-5. Prove the new mean is 3m-5 (case 27). [U6-M02-Q27] [5 marks]

8. For the data [6, 10, 12, 18, 15, 20], find the mean and range. [U6-M02-Q28] [2 marks]

9. The mean of 8 values is 13. Find their total. [U6-M02-Q29] [2 marks]

10. The mean of 14 values is 25. One value 64 is removed. Find the new mean. [U6-M02-Q30] [4 marks]

MODULE 02 / S4

Averages, Quartiles, Spread, Outliers and Algebra

MULTI-STEP HIGHER • PART C

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Complete the multi-step set. Check units, accuracy and reasonableness.

11. **A data set has lower quartile 12, median 22, upper quartile 31. Find the IQR and interpret it. [U6-M02-Q31]** **[3 marks]**

12. **A data set has Q1=11, Q3=37. Use the 1.5×IQR rule to give outlier fences. [U6-M02-Q32]** **[4 marks]**

13. **Two groups have means 60 and 72, with sizes 24 and 35. Find the combined mean. [U6-M02-Q33]** **[4 marks]**

14. **The mean of x, x+2, 2x-1 and 13 is 9. Find x. [U6-M02-Q34]** **[4 marks]**

15. **Explain why median and IQR may be preferred to mean and range for skewed data with outliers (case 35). [U6-M02-Q35]** **[4 marks]**

MODULE 02 / S4

Averages, Quartiles, Spread, Outliers and Algebra

GRADE 7-9 CHALLENGE • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Extended reasoning. Plan the model before calculating.

1. A set has n values and mean m. Every value is transformed to 3x-5. Prove the new mean is 3m-5 (case 36). [U6-M02-Q36] [5 marks]

2. For the data [5, 7, 9, 13, 15, 19], find the mean and range. [U6-M02-Q37] [2 marks]

3. The mean of 10 values is 13. Find their total. [U6-M02-Q38] [2 marks]

4. The mean of 13 values is 22. One value 73 is removed. Find the new mean. [U6-M02-Q39] [4 marks]

5. A data set has lower quartile 16, median 24, upper quartile 34. Find the IQR and interpret it. [U6-M02-Q40] [3 marks]

MODULE 02 / S4

Averages, Quartiles, Spread, Outliers and Algebra

GRADE 7-9 CHALLENGE • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Complete the challenge set. Present a clear mathematical argument.

6. **A data set has Q1=14, Q3=30. Use the 1.5×IQR rule to give outlier fences. [U6-M02-Q41]** **[4 marks]**

7. **Two groups have means 61 and 71, with sizes 26 and 35. Find the combined mean. [U6-M02-Q42]** **[4 marks]**

8. **The mean of x, x+2, 2x-1 and 12 is 10. Find x. [U6-M02-Q43]** **[4 marks]**

9. **Explain why median and IQR may be preferred to mean and range for skewed data with outliers (case 44). [U6-M02-Q44]** **[4 marks]**

10. **A set has n values and mean m. Every value is transformed to 3x-5. Prove the new mean is 3m-5 (case 45). [U6-M02-Q45]** **[5 marks]**

MODULE 03 / S2,S4

Frequency Tables, Grouped Data and Estimated Means

FLUENCY CHECK

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

A short prerequisite check. Work accurately, then move promptly to Higher demand.

1. Values 1,2,3,4 have frequencies [4, 8, 12, 6]. Find the exact mean. [U6-M03-Q01] [3 marks]

2. Grouped classes 0-<10, 10-<20, 20-<30, 30-<40 have frequencies [5, 9, 13, 7]. Estimate the mean. [U6-M03-Q02] [3 marks]

3. Explain why a mean calculated from grouped data is an estimate (case 3). [U6-M03-Q03] [3 marks]

4. Grouped classes 0-<10, 10-<20, 20-<30 and 30-<40 have frequencies 4, 8, x and 6. Their estimated mean is 675/31. Find x. [U6-M03-Q04] [4 marks]

5. Classes 0-<5, 5-<15, 15-<30 have frequencies 5, 14, 19. Identify the modal class and estimate the median class. [U6-M03-Q05] [4 marks]

6. A grouped table has class boundaries measured to the nearest unit. Explain why continuous boundaries such as 9.5 and 19.5 may be needed (case 6). [U6-M03-Q06] [4 marks]

7. Prove the estimated mean must lie between the smallest and largest class midpoint (case 7). [U6-M03-Q07] [4 marks]

8. Compare two grouped distributions using estimated means 20.41 and 23.81, with IQRs 10 and 15. [U6-M03-Q08] **[4 marks]**

MODULE 03 / S2,S4

Frequency Tables, Grouped Data and Estimated Means

STANDARD HIGHER • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Higher-tier application. Show the governing relationship and exact working.

1. Values 1,2,3,4 have frequencies [4, 11, 14, 8]. Find the exact mean. [U6-M03-Q09] **[3 marks]**

2. Grouped classes 0-<10, 10-<20, 20-<30, 30-<40 have frequencies [5, 12, 15, 6]. Estimate the mean. [U6-M03-Q10] **[3 marks]**

3. Explain why a mean calculated from grouped data is an estimate (case 11). [U6-M03-Q11] **[3 marks]**

4. Grouped classes 0-<10, 10-<20, 20-<30 and 30-<40 have frequencies 4, 8, x and 6. Their estimated mean is 625/29. Find x. [U6-M03-Q12] **[4 marks]**

5. Classes 0-<5, 5-<15, 15-<30 have frequencies 5, 12, 15. Identify the modal class and estimate the median class. [U6-M03-Q13] **[4 marks]**

6. A grouped table has class boundaries measured to the nearest unit. Explain why continuous boundaries such as 9.5 and 19.5 may be needed (case 14). [U6-M03-Q14] **[4 marks]**

MODULE 03 / S2,S4

Frequency Tables, Grouped Data and Estimated Means

STANDARD HIGHER • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Continue the Higher set. Interpret each result in context.

7. Prove the estimated mean must lie between the smallest and largest class midpoint (case 15). [U6-M03-Q15] [4 marks]

8. Compare two grouped distributions using estimated means 20.56 and 23.96, with IQRs 8 and 15. [U6-M03-Q16] [4 marks]

9. Values 1,2,3,4 have frequencies [4, 9, 16, 7]. Find the exact mean. [U6-M03-Q17] [3 marks]

10. Grouped classes 0-<10, 10-<20, 20-<30, 30-<40 have frequencies [5, 10, 17, 8]. Estimate the mean. [U6-M03-Q18] [3 marks]

11. Explain why a mean calculated from grouped data is an estimate (case 19). [U6-M03-Q19] [3 marks]

12. Grouped classes 0-<10, 10-<20, 20-<30 and 30-<40 have frequencies 4, 8, x and 6. Their estimated mean is 175/8. Find x. [U6-M03-Q20] [4 marks]

MODULE 03 / S2,S4

Frequency Tables, Grouped Data and Estimated Means

MULTI-STEP HIGHER • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Original multi-step exam-style questions. Show every connected stage.

1. Classes 0-<5, 5-<15, 15-<30 have frequencies 5, 10, 17. Identify the modal class and estimate the median class. [U6-M03-Q21] [4 marks]

2. A grouped table has class boundaries measured to the nearest unit. Explain why continuous boundaries such as 9.5 and 19.5 may be needed (case 22). [U6-M03-Q22] [4 marks]

3. Prove the estimated mean must lie between the smallest and largest class midpoint (case 23). [U6-M03-Q23] [4 marks]

4. Compare two grouped distributions using estimated means 21.05 and 24.45, with IQRs 11 and 15. [U6-M03-Q24] [4 marks]

5. Values 1,2,3,4 have frequencies [4, 12, 12, 6]. Find the exact mean. [U6-M03-Q25] [3 marks]

MODULE 03 / S2,S4

Frequency Tables, Grouped Data and Estimated Means

MULTI-STEP HIGHER • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Continue the multi-step set. Explain decisions where requested.

6. **Grouped classes 0-<10, 10-<20, 20-<30, 30-<40 have frequencies [5, 8, 13, 7]. Estimate the mean. [U6-M03-Q26]** **[3 marks]**

7. **Explain why a mean calculated from grouped data is an estimate (case 27). [U6-M03-Q27]** **[3 marks]**

8. **Grouped classes 0-<10, 10-<20, 20-<30 and 30-<40 have frequencies 4, 8, x and 6. Their estimated mean is 65/3. Find x. [U6-M03-Q28]** **[4 marks]**

9. **Classes 0-<5, 5-<15, 15-<30 have frequencies 5, 13, 19. Identify the modal class and estimate the median class. [U6-M03-Q29]** **[4 marks]**

10. **A grouped table has class boundaries measured to the nearest unit. Explain why continuous boundaries such as 9.5 and 19.5 may be needed (case 30). [U6-M03-Q30]** **[4 marks]**

MODULE 03 / S2,S4

Frequency Tables, Grouped Data and Estimated Means

MULTI-STEP HIGHER • PART C

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Complete the multi-step set. Check units, accuracy and reasonableness.

11. **Prove the estimated mean must lie between the smallest and largest class midpoint (case 31). [U6-M03-Q31]** **[4 marks]**

12. **Compare two grouped distributions using estimated means 20.56 and 23.96, with IQRs 9 and 15. [U6-M03-Q32]** **[4 marks]**

13. **Values 1,2,3,4 have frequencies [4, 10, 14, 8]. Find the exact mean. [U6-M03-Q33]** **[3 marks]**

14. **Grouped classes 0-<10, 10-<20, 20-<30, 30-<40 have frequencies [5, 11, 15, 6]. Estimate the mean. [U6-M03-Q34]** **[3 marks]**

15. **Explain why a mean calculated from grouped data is an estimate (case 35). [U6-M03-Q35]** **[3 marks]**

MODULE 03 / S2,S4

Frequency Tables, Grouped Data and Estimated Means

GRADE 7-9 CHALLENGE • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Extended reasoning. Plan the model before calculating.

1. Grouped classes 0-<10, 10-<20, 20-<30 and 30-<40 have frequencies 4, 8, x and 6. Their estimated mean is 150/7. Find x. [U6-M03-Q36] [4 marks]

2. Classes 0-<5, 5-<15, 15-<30 have frequencies 5, 11, 15. Identify the modal class and estimate the median class. [U6-M03-Q37] [4 marks]

3. A grouped table has class boundaries measured to the nearest unit. Explain why continuous boundaries such as 9.5 and 19.5 may be needed (case 38). [U6-M03-Q38] [4 marks]

4. Prove the estimated mean must lie between the smallest and largest class midpoint (case 39). [U6-M03-Q39] [4 marks]

5. Compare two grouped distributions using estimated means 20.00 and 23.40, with IQRs 12 and 15. [U6-M03-Q40] [4 marks]

MODULE 03 / S2,S4

Frequency Tables, Grouped Data and Estimated Means

GRADE 7-9 CHALLENGE • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Complete the challenge set. Present a clear mathematical argument.

6. **Values 1,2,3,4 have frequencies [4, 8, 16, 7]. Find the exact mean. [U6-M03-Q41]** **[3 marks]**

7. **Grouped classes 0-<10, 10-<20, 20-<30, 30-<40 have frequencies [5, 9, 17, 8]. Estimate the mean. [U6-M03-Q42]** **[3 marks]**

8. **Explain why a mean calculated from grouped data is an estimate (case 43). [U6-M03-Q43]** **[3 marks]**

9. **Grouped classes 0-<10, 10-<20, 20-<30 and 30-<40 have frequencies 4, 8, x and 6. Their estimated mean is 675/31. Find x. [U6-M03-Q44]** **[4 marks]**

10. **Classes 0-<5, 5-<15, 15-<30 have frequencies 5, 14, 17. Identify the modal class and estimate the median class. [U6-M03-Q45]** **[4 marks]**

MODULE 04 / S2,S4

Statistical Diagrams, Time Series and Misleading Graphs

FLUENCY CHECK

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

A short prerequisite check. Work accurately, then move promptly to Higher demand.

1. A category has frequency 24 out of 120. Find its pie-chart angle. [U6-M04-Q01] [2 marks]

2. A pie-chart sector is 72° and represents 25 people. Find the total frequency. [U6-M04-Q02] [3 marks]

3. Monthly values are 22, 26, 21, 29, 32, 28. Calculate a three-point moving average for the middle four positions. [U6-M04-Q03] [4 marks]

4. A time series has trend increasing by 5 per quarter plus seasonal variation. Explain how moving averages help (case 4). [U6-M04-Q04] [4 marks]

5. Choose between a bar chart, pie chart, line graph, histogram and scatter graph for recording daily temperature over a year, and justify. [U6-M04-Q05] [3 marks]

6. A graph truncates its vertical axis at 55 and makes a rise from 57 to 61 look dramatic. Explain the distortion. [U6-M04-Q06] [4 marks]

7. Two pie charts represent samples of 156 and 312. Explain why equal sector angles do not mean equal frequencies (case 7). [U6-M04-Q07] [3 marks]

8. Design an appropriate chart and annotation plan to compare category proportions across three unequal groups (variant 8). [U6-M04-Q08] **[4 marks]**

MODULE 04 / S2,S4

Statistical Diagrams, Time Series and Misleading Graphs

STANDARD HIGHER • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Higher-tier application. Show the governing relationship and exact working.

1. A category has frequency 32 out of 168. Find its pie-chart angle. [U6-M04-Q09] [2 marks]

2. A pie-chart sector is 72° and represents 33 people. Find the total frequency. [U6-M04-Q10] [3 marks]

3. Monthly values are 30, 34, 29, 37, 40, 36. Calculate a three-point moving average for the middle four positions. [U6-M04-Q11] [4 marks]

4. A time series has trend increasing by 3 per quarter plus seasonal variation. Explain how moving averages help (case 12). [U6-M04-Q12] [4 marks]

5. Choose between a bar chart, pie chart, line graph, histogram and scatter graph for recording daily temperature over a year, and justify. [U6-M04-Q13] [3 marks]

6. A graph truncates its vertical axis at 63 and makes a rise from 65 to 69 look dramatic. Explain the distortion. [U6-M04-Q14] [4 marks]

MODULE 04 / S2,S4

Statistical Diagrams, Time Series and Misleading Graphs

STANDARD HIGHER • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Continue the Higher set. Interpret each result in context.

7. **Two pie charts represent samples of 204 and 408. Explain why equal sector angles do not mean equal frequencies (case 15). [U6-M04-Q15]** **[3 marks]**

8. **Design an appropriate chart and annotation plan to compare category proportions across three unequal groups (variant 16). [U6-M04-Q16]** **[4 marks]**

9. **A category has frequency 40 out of 216. Find its pie-chart angle. [U6-M04-Q17]** **[2 marks]**

10. **A pie-chart sector is 72° and represents 41 people. Find the total frequency. [U6-M04-Q18]** **[3 marks]**

11. **Monthly values are 38, 42, 37, 45, 48, 44. Calculate a three-point moving average for the middle four positions. [U6-M04-Q19]** **[4 marks]**

12. **A time series has trend increasing by 6 per quarter plus seasonal variation. Explain how moving averages help (case 20). [U6-M04-Q20]** **[4 marks]**

MODULE 04 / S2,S4

Statistical Diagrams, Time Series and Misleading Graphs

MULTI-STEP HIGHER • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Original multi-step exam-style questions. Show every connected stage.

1. Choose between a bar chart, pie chart, line graph, histogram and scatter graph for recording daily temperature over a year, and justify. [U6-M04-Q21] [3 marks]

2. A graph truncates its vertical axis at 71 and makes a rise from 73 to 77 look dramatic. Explain the distortion. [U6-M04-Q22] [4 marks]

3. Two pie charts represent samples of 252 and 504. Explain why equal sector angles do not mean equal frequencies (case 23). [U6-M04-Q23] [3 marks]

4. Design an appropriate chart and annotation plan to compare category proportions across three unequal groups (variant 24). [U6-M04-Q24] [4 marks]

5. A category has frequency 28 out of 264. Find its pie-chart angle. [U6-M04-Q25] [2 marks]

MODULE 04 / S2,S4

Statistical Diagrams, Time Series and Misleading Graphs

MULTI-STEP HIGHER • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Continue the multi-step set. Explain decisions where requested.

6. **A pie-chart sector is 72° and represents 29 people. Find the total frequency. [U6-M04-Q26]** **[3 marks]**

7. **Monthly values are 46, 50, 45, 53, 56, 52. Calculate a three-point moving average for the middle four positions. [U6-M04-Q27]** **[4 marks]**

8. **A time series has trend increasing by 4 per quarter plus seasonal variation. Explain how moving averages help (case 28). [U6-M04-Q28]** **[4 marks]**

9. **Choose between a bar chart, pie chart, line graph, histogram and scatter graph for recording daily temperature over a year, and justify. [U6-M04-Q29]** **[3 marks]**

10. **A graph truncates its vertical axis at 79 and makes a rise from 81 to 85 look dramatic. Explain the distortion. [U6-M04-Q30]** **[4 marks]**

MODULE 04 / S2,S4

Statistical Diagrams, Time Series and Misleading Graphs

MULTI-STEP HIGHER • PART C

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Complete the multi-step set. Check units, accuracy and reasonableness.

11. **Two pie charts represent samples of 300 and 600. Explain why equal sector angles do not mean equal frequencies (case 31). [U6-M04-Q31]** [3 marks]

12. **Design an appropriate chart and annotation plan to compare category proportions across three unequal groups (variant 32). [U6-M04-Q32]** [4 marks]

13. **A category has frequency 36 out of 312. Find its pie-chart angle. [U6-M04-Q33]** [2 marks]

14. **A pie-chart sector is 72° and represents 37 people. Find the total frequency. [U6-M04-Q34]** [3 marks]

15. **Monthly values are 54, 58, 53, 61, 64, 60. Calculate a three-point moving average for the middle four positions. [U6-M04-Q35]** [4 marks]

MODULE 04 / S2,S4

Statistical Diagrams, Time Series and Misleading Graphs

GRADE 7-9 CHALLENGE • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Extended reasoning. Plan the model before calculating.

1. A time series has trend increasing by 2 per quarter plus seasonal variation. Explain how moving averages help (case 36). [U6-M04-Q36] [4 marks]

2. Choose between a bar chart, pie chart, line graph, histogram and scatter graph for recording daily temperature over a year, and justify. [U6-M04-Q37] [3 marks]

3. A graph truncates its vertical axis at 87 and makes a rise from 89 to 93 look dramatic. Explain the distortion. [U6-M04-Q38] [4 marks]

4. Two pie charts represent samples of 348 and 696. Explain why equal sector angles do not mean equal frequencies (case 39). [U6-M04-Q39] [3 marks]

5. Design an appropriate chart and annotation plan to compare category proportions across three unequal groups (variant 40). [U6-M04-Q40] [4 marks]

MODULE 04 / S2,S4

Statistical Diagrams, Time Series and Misleading Graphs

GRADE 7-9 CHALLENGE • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Complete the challenge set. Present a clear mathematical argument.

6. **A category has frequency 24 out of 360. Find its pie-chart angle. [U6-M04-Q41]** **[2 marks]**

7. **A pie-chart sector is 72° and represents 25 people. Find the total frequency. [U6-M04-Q42]** **[3 marks]**

8. **Monthly values are 62, 66, 61, 69, 72, 68. Calculate a three-point moving average for the middle four positions. [U6-M04-Q43]** **[4 marks]**

9. **A time series has trend increasing by 5 per quarter plus seasonal variation. Explain how moving averages help (case 44). [U6-M04-Q44]** **[4 marks]**

10. **Choose between a bar chart, pie chart, line graph, histogram and scatter graph for recording daily temperature over a year, and justify. [U6-M04-Q45]** **[3 marks]**

MODULE 05 / S3,S4

Cumulative Frequency, Quartiles and Box Plots

FLUENCY CHECK

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

A short prerequisite check. Work accurately, then move promptly to Higher demand.

1. A cumulative frequency table has total 100. State the positions used to estimate Q1, median and Q3. [U6-M05-Q01] [2 marks]

2. A box plot has minimum 9, Q1=19, median=31, Q3=45, maximum=61. Find range and IQR. [U6-M05-Q02] [3 marks]

3. Two box plots have medians 32, 37 and IQRs 14, 10. Compare the distributions. [U6-M05-Q03] [3 marks]

4. A cumulative frequency curve has total 112. Explain how to estimate how many values exceed x=40 when CF(40)=48. [U6-M05-Q04] [3 marks]

5. A grouped class from 20 to 30 raises cumulative frequency from 34 to 54. Estimate the value at cumulative frequency 44. [U6-M05-Q05] [4 marks]

6. Explain two limitations of comparing distributions using box plots alone (case 6). [U6-M05-Q06] [4 marks]

7. A student plots cumulative frequencies at class midpoints. Explain the error and correct method (variant 7). [U6-M05-Q07] [4 marks]

8. **Construct a box plot from minimum 8, Q1=18, median=37, Q3=51, maximum=66; state all plotting checks. [U6-M05-Q08]** **[4 marks]**

MODULE 05 / S3,S4

Cumulative Frequency, Quartiles and Box Plots

STANDARD HIGHER • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Higher-tier application. Show the governing relationship and exact working.

1. A cumulative frequency table has total 132. State the positions used to estimate Q1, median and Q3. [U6-M05-Q09] [2 marks]

2. A box plot has minimum 12, Q1=20, median=30, Q3=45, maximum=69. Find range and IQR. [U6-M05-Q10] [3 marks]

3. Two box plots have medians 32, 38 and IQRs 12, 10. Compare the distributions. [U6-M05-Q11] [3 marks]

4. A cumulative frequency curve has total 144. Explain how to estimate how many values exceed x=40 when CF(40)=56. [U6-M05-Q12] [3 marks]

5. A grouped class from 20 to 30 raises cumulative frequency from 42 to 62. Estimate the value at cumulative frequency 52. [U6-M05-Q13] [4 marks]

6. Explain two limitations of comparing distributions using box plots alone (case 14). [U6-M05-Q14] [4 marks]

MODULE 05 / S3,S4

Cumulative Frequency, Quartiles and Box Plots

STANDARD HIGHER • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Continue the Higher set. Interpret each result in context.

7. **A student plots cumulative frequencies at class midpoints. Explain the error and correct method (variant 15). [U6-M05-Q15]** [4 marks]

8. **Construct a box plot from minimum 8, Q1=19, median=36, Q3=51, maximum=68; state all plotting checks. [U6-M05-Q16]** [4 marks]

9. **A cumulative frequency table has total 164. State the positions used to estimate Q1, median and Q3. [U6-M05-Q17]** [2 marks]

10. **A box plot has minimum 10, Q1=21, median=38, Q3=45, maximum=67. Find range and IQR. [U6-M05-Q18]** [3 marks]

11. **Two box plots have medians 32, 39 and IQRs 15, 10. Compare the distributions. [U6-M05-Q19]** [3 marks]

12. **A cumulative frequency curve has total 176. Explain how to estimate how many values exceed x=40 when CF(40)=64. [U6-M05-Q20]** [3 marks]

MODULE 05 / S3,S4

Cumulative Frequency, Quartiles and Box Plots

MULTI-STEP HIGHER • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Original multi-step exam-style questions. Show every connected stage.

1. A grouped class from 20 to 30 raises cumulative frequency from 50 to 70. Estimate the value at cumulative frequency 60. [U6-M05-Q21] [4 marks]

2. Explain two limitations of comparing distributions using box plots alone (case 22). [U6-M05-Q22] [4 marks]

3. A student plots cumulative frequencies at class midpoints. Explain the error and correct method (variant 23). [U6-M05-Q23] [4 marks]

4. Construct a box plot from minimum 8, Q1=20, median=35, Q3=51, maximum=70; state all plotting checks. [U6-M05-Q24] [4 marks]

5. A cumulative frequency table has total 196. State the positions used to estimate Q1, median and Q3. [U6-M05-Q25] [2 marks]

MODULE 05 / S3,S4

Cumulative Frequency, Quartiles and Box Plots

MULTI-STEP HIGHER • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Continue the multi-step set. Explain decisions where requested.

6. A box plot has minimum 8, Q1=22, median=37, Q3=45, maximum=65. Find range and IQR. [U6-M05-Q26] [3 marks]

7. Two box plots have medians 32, 40 and IQRs 13, 10. Compare the distributions. [U6-M05-Q27] [3 marks]

8. A cumulative frequency curve has total 208. Explain how to estimate how many values exceed x=40 when CF(40)=72. [U6-M05-Q28] [3 marks]

9. A grouped class from 20 to 30 raises cumulative frequency from 58 to 78. Estimate the value at cumulative frequency 68. [U6-M05-Q29] [4 marks]

10. Explain two limitations of comparing distributions using box plots alone (case 30). [U6-M05-Q30] [4 marks]

MODULE 05 / S3,S4

Cumulative Frequency, Quartiles and Box Plots

MULTI-STEP HIGHER • PART C

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Complete the multi-step set. Check units, accuracy and reasonableness.

11. **A student plots cumulative frequencies at class midpoints. Explain the error and correct method (variant 31). [U6-M05-Q31]** [4 marks]

12. **Construct a box plot from minimum 8, Q1=21, median=34, Q3=51, maximum=66; state all plotting checks. [U6-M05-Q32]** [4 marks]

13. **A cumulative frequency table has total 228. State the positions used to estimate Q1, median and Q3. [U6-M05-Q33]** [2 marks]

14. **A box plot has minimum 11, Q1=23, median=36, Q3=45, maximum=63. Find range and IQR. [U6-M05-Q34]** [3 marks]

15. **Two box plots have medians 32, 41 and IQRs 16, 10. Compare the distributions. [U6-M05-Q35]** [3 marks]

MODULE 05 / S3,S4

Cumulative Frequency, Quartiles and Box Plots

GRADE 7-9 CHALLENGE • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Extended reasoning. Plan the model before calculating.

1. A cumulative frequency curve has total 240. Explain how to estimate how many values exceed x=40 when CF(40)=80. [U6-M05-Q36] [3 marks]

2. A grouped class from 20 to 30 raises cumulative frequency from 66 to 86. Estimate the value at cumulative frequency 76. [U6-M05-Q37] [4 marks]

3. Explain two limitations of comparing distributions using box plots alone (case 38). [U6-M05-Q38] [4 marks]

4. A student plots cumulative frequencies at class midpoints. Explain the error and correct method (variant 39). [U6-M05-Q39] [4 marks]

5. Construct a box plot from minimum 8, Q1=22, median=33, Q3=51, maximum=68; state all plotting checks. [U6-M05-Q40] [4 marks]

MODULE 05 / S3,S4

Cumulative Frequency, Quartiles and Box Plots

GRADE 7-9 CHALLENGE • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Complete the challenge set. Present a clear mathematical argument.

6. A cumulative frequency table has total 260. State the positions used to estimate Q1, median and Q3. [U6-M05-Q41] [2 marks]

7. A box plot has minimum 9, Q1=24, median=35, Q3=45, maximum=61. Find range and IQR. [U6-M05-Q42] [3 marks]

8. Two box plots have medians 32, 35 and IQRs 14, 10. Compare the distributions. [U6-M05-Q43] [3 marks]

9. A cumulative frequency curve has total 272. Explain how to estimate how many values exceed x=40 when CF(40)=88. [U6-M05-Q44] [3 marks]

10. A grouped class from 20 to 30 raises cumulative frequency from 74 to 94. Estimate the value at cumulative frequency 84. [U6-M05-Q45] [4 marks]

MODULE 06 / S3,S4

Histograms and Frequency Density

FLUENCY CHECK

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

A short prerequisite check. Work accurately, then move promptly to Higher demand.

1. A histogram class has width 5 and frequency 6. Find its frequency density. [U6-M06-Q01] [2 marks]

2. A histogram bar has width 10 and density 1.3. Find its frequency. [U6-M06-Q02] [3 marks]

3. Classes have widths 5, 10, 20 and frequencies 7, 14, 22. Calculate all densities. [U6-M06-Q03] [3 marks]

4. In a histogram, one bar area is 33 and represents frequency 18. Find the scale factor from area to frequency. [U6-M06-Q04] [4 marks]

5. A class 10-<30 has frequency 44. It is split at 20 in the ratio 3:2. Give the two new densities. [U6-M06-Q05] [4 marks]

6. Explain why frequency, rather than density, cannot be used directly as histogram height for unequal classes (case 6). [U6-M06-Q06] [4 marks]

7. A histogram has missing frequency x in a class of width 15; its density is twice that of a class width 10, frequency 12. Find x. [U6-M06-Q07] [4 marks]

8. Compare a histogram and bar chart, including gap, width and area conventions (variant 8). [U6-M06-Q08] **[4 marks]**

MODULE 06 / S3,S4

Histograms and Frequency Density

STANDARD HIGHER • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Higher-tier application. Show the governing relationship and exact working.

1. A histogram class has width 5 and frequency 14. Find its frequency density. [U6-M06-Q09] [2 marks]

2. A histogram bar has width 10 and density 1.3. Find its frequency. [U6-M06-Q10] [3 marks]

3. Classes have widths 5, 10, 20 and frequencies 9, 14, 20. Calculate all densities. [U6-M06-Q11] [3 marks]

4. In a histogram, one bar area is 41 and represents frequency 16. Find the scale factor from area to frequency. [U6-M06-Q12] [4 marks]

5. A class 10-<30 has frequency 52. It is split at 20 in the ratio 3:2. Give the two new densities. [U6-M06-Q13] [4 marks]

6. Explain why frequency, rather than density, cannot be used directly as histogram height for unequal classes (case 14). [U6-M06-Q14] [4 marks]

MODULE 06 / S3,S4

Histograms and Frequency Density

STANDARD HIGHER • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Continue the Higher set. Interpret each result in context.

7. **A histogram has missing frequency x in a class of width 15; its density is twice that of a class width 10, frequency 20. Find x. [U6-M06-Q15]** [4 marks]

8. **Compare a histogram and bar chart, including gap, width and area conventions (variant 16). [U6-M06-Q16]** [4 marks]

9. **A histogram class has width 5 and frequency 22. Find its frequency density. [U6-M06-Q17]** [2 marks]

10. **A histogram bar has width 10 and density 1.3. Find its frequency. [U6-M06-Q18]** [3 marks]

11. **Classes have widths 5, 10, 20 and frequencies 5, 14, 28. Calculate all densities. [U6-M06-Q19]** [3 marks]

12. **In a histogram, one bar area is 49 and represents frequency 19. Find the scale factor from area to frequency. [U6-M06-Q20]** [4 marks]

MODULE 06 / S3,S4

Histograms and Frequency Density

MULTI-STEP HIGHER • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Original multi-step exam-style questions. Show every connected stage.

1. A class 10-<30 has frequency 60. It is split at 20 in the ratio 3:2. Give the two new densities. [U6-M06-Q21] [4 marks]

2. Explain why frequency, rather than density, cannot be used directly as histogram height for unequal classes (case 22). [U6-M06-Q22] [4 marks]

3. A histogram has missing frequency x in a class of width 15; its density is twice that of a class width 10, frequency 8. Find x. [U6-M06-Q23] [4 marks]

4. Compare a histogram and bar chart, including gap, width and area conventions (variant 24). [U6-M06-Q24] [4 marks]

5. A histogram class has width 5 and frequency 10. Find its frequency density. [U6-M06-Q25] [2 marks]

MODULE 06 / S3,S4

Histograms and Frequency Density

MULTI-STEP HIGHER • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Continue the multi-step set. Explain decisions where requested.

6. A histogram bar has width 10 and density 1.3. Find its frequency. [U6-M06-Q26] [3 marks]

7. Classes have widths 5, 10, 20 and frequencies 7, 14, 26. Calculate all densities. [U6-M06-Q27] [3 marks]

8. In a histogram, one bar area is 57 and represents frequency 17. Find the scale factor from area to frequency. [U6-M06-Q28] [4 marks]

9. A class 10-<30 has frequency 68. It is split at 20 in the ratio 3:2. Give the two new densities. [U6-M06-Q29] [4 marks]

10. Explain why frequency, rather than density, cannot be used directly as histogram height for unequal classes (case 30). [U6-M06-Q30] [4 marks]

MODULE 06 / S3,S4

Histograms and Frequency Density

MULTI-STEP HIGHER • PART C

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Complete the multi-step set. Check units, accuracy and reasonableness.

11. **A histogram has missing frequency x in a class of width 15; its density is twice that of a class width 10, frequency 16. Find x. [U6-M06-Q31]** [4 marks]

12. **Compare a histogram and bar chart, including gap, width and area conventions (variant 32). [U6-M06-Q32]** [4 marks]

13. **A histogram class has width 5 and frequency 18. Find its frequency density. [U6-M06-Q33]** [2 marks]

14. **A histogram bar has width 10 and density 1.3. Find its frequency. [U6-M06-Q34]** [3 marks]

15. **Classes have widths 5, 10, 20 and frequencies 9, 14, 24. Calculate all densities. [U6-M06-Q35]** [3 marks]

MODULE 06 / S3,S4

Histograms and Frequency Density

GRADE 7-9 CHALLENGE • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Extended reasoning. Plan the model before calculating.

1. In a histogram, one bar area is 65 and represents frequency 15. Find the scale factor from area to frequency. [U6-M06-Q36] [4 marks]

2. A class 10-<30 has frequency 76. It is split at 20 in the ratio 3:2. Give the two new densities. [U6-M06-Q37] [4 marks]

3. Explain why frequency, rather than density, cannot be used directly as histogram height for unequal classes (case 38). [U6-M06-Q38] [4 marks]

4. A histogram has missing frequency x in a class of width 15; its density is twice that of a class width 10, frequency 24. Find x. [U6-M06-Q39] [4 marks]

5. Compare a histogram and bar chart, including gap, width and area conventions (variant 40). [U6-M06-Q40] [4 marks]

MODULE 06 / S3,S4

Histograms and Frequency Density

GRADE 7-9 CHALLENGE • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Complete the challenge set. Present a clear mathematical argument.

6. **A histogram class has width 5 and frequency 6. Find its frequency density. [U6-M06-Q41]** **[2 marks]**

7. **A histogram bar has width 10 and density 1.3. Find its frequency. [U6-M06-Q42]** **[3 marks]**

8. **Classes have widths 5, 10, 20 and frequencies 5, 14, 22. Calculate all densities. [U6-M06-Q43]** **[3 marks]**

9. **In a histogram, one bar area is 73 and represents frequency 18. Find the scale factor from area to frequency. [U6-M06-Q44]** **[4 marks]**

10. **A class 10-<30 has frequency 84. It is split at 20 in the ratio 3:2. Give the two new densities. [U6-M06-Q45]** **[4 marks]**

MODULE 07 / S6

Scatter Graphs, Correlation, Best Fit and Prediction

FLUENCY CHECK

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

A short prerequisite check. Work accurately, then move promptly to Higher demand.

1. A line of best fit is y=1.5x+5. Estimate y when x=20. [U6-M07-Q01] [2 marks]

2. A scatter graph shows points rising closely from left to right. Describe correlation and what it means. [U6-M07-Q02] [3 marks]

3. A line of best fit passes through (12,22) and (32,52). Find its equation. [U6-M07-Q03] [4 marks]

4. Use y=1.8x+8 to estimate x when y=63, and state whether this is interpolation if observed x-values are 10-50. [U6-M07-Q04] [4 marks]

5. Explain why extrapolating a scatter trend far beyond the observed range is dangerous (case 5). [U6-M07-Q05] [4 marks]

6. A hidden variable could explain correlation between ice-cream sales and sunburn cases. Name it and explain confounding. [U6-M07-Q06] [4 marks]

7. A point lies far from the pattern. Explain how it may affect the line of best fit and what should be checked (case 7). [U6-M07-Q07] [4 marks]

8. Design a scatter-graph investigation, naming explanatory/response variables and controls (variant 8). [U6-M07-Q08] **[5 marks]**

MODULE 07 / S6

Scatter Graphs, Correlation, Best Fit and Prediction

STANDARD HIGHER • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Higher-tier application. Show the governing relationship and exact working.

1. A line of best fit is y=1.5x+6. Estimate y when x=28. [U6-M07-Q09] [2 marks]

2. A scatter graph shows points rising closely from left to right. Describe correlation and what it means. [U6-M07-Q10] [3 marks]

3. A line of best fit passes through (10,30) and (33,60). Find its equation. [U6-M07-Q11] [4 marks]

4. Use y=1.8x+9 to estimate x when y=71, and state whether this is interpolation if observed x-values are 10-50. [U6-M07-Q12] [4 marks]

5. Explain why extrapolating a scatter trend far beyond the observed range is dangerous (case 13). [U6-M07-Q13] [4 marks]

6. A hidden variable could explain correlation between ice-cream sales and sunburn cases. Name it and explain confounding. [U6-M07-Q14] [4 marks]

MODULE 07 / S6

Scatter Graphs, Correlation, Best Fit and Prediction

STANDARD HIGHER • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Continue the Higher set. Interpret each result in context.

7. **A point lies far from the pattern. Explain how it may affect the line of best fit and what should be checked (case 15). [U6-M07-Q15]** [4 marks]

8. **Design a scatter-graph investigation, naming explanatory/response variables and controls (variant 16). [U6-M07-Q16]** [5 marks]

9. **A line of best fit is y=1.5x+7. Estimate y when x=36. [U6-M07-Q17]** [2 marks]

10. **A scatter graph shows points rising closely from left to right. Describe correlation and what it means. [U6-M07-Q18]** [3 marks]

11. **A line of best fit passes through (13,38) and (34,68). Find its equation. [U6-M07-Q19]** [4 marks]

12. **Use y=1.8x+10 to estimate x when y=79, and state whether this is interpolation if observed x-values are 10-50. [U6-M07-Q20]** [4 marks]

MODULE 07 / S6

Scatter Graphs, Correlation, Best Fit and Prediction

MULTI-STEP HIGHER • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Original multi-step exam-style questions. Show every connected stage.

1. Explain why extrapolating a scatter trend far beyond the observed range is dangerous (case 21). [U6-M07-Q21] [4 marks]

2. A hidden variable could explain correlation between ice-cream sales and sunburn cases. Name it and explain confounding. [U6-M07-Q22] [4 marks]

3. A point lies far from the pattern. Explain how it may affect the line of best fit and what should be checked (case 23). [U6-M07-Q23] [4 marks]

4. Design a scatter-graph investigation, naming explanatory/response variables and controls (variant 24). [U6-M07-Q24] [5 marks]

5. A line of best fit is y=1.5x+8. Estimate y when x=44. [U6-M07-Q25] [2 marks]

MODULE 07 / S6

Scatter Graphs, Correlation, Best Fit and Prediction

MULTI-STEP HIGHER • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Continue the multi-step set. Explain decisions where requested.

6. A scatter graph shows points rising closely from left to right. Describe correlation and what it means. [U6-M07-Q26] [3 marks]

7. A line of best fit passes through (11,46) and (35,76). Find its equation. [U6-M07-Q27] [4 marks]

8. Use y=1.8x+11 to estimate x when y=87, and state whether this is interpolation if observed x-values are 10-50. [U6-M07-Q28] [4 marks]

9. Explain why extrapolating a scatter trend far beyond the observed range is dangerous (case 29). [U6-M07-Q29] [4 marks]

10. A hidden variable could explain correlation between ice-cream sales and sunburn cases. Name it and explain confounding. [U6-M07-Q30] [4 marks]

MODULE 07 / S6

Scatter Graphs, Correlation, Best Fit and Prediction

MULTI-STEP HIGHER • PART C

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Complete the multi-step set. Check units, accuracy and reasonableness.

11. A point lies far from the pattern. Explain how it may affect the line of best fit and what should be checked (case 31). [U6-M07-Q31] [4 marks]

12. Design a scatter-graph investigation, naming explanatory/response variables and controls (variant 32). [U6-M07-Q32] [5 marks]

13. A line of best fit is y=1.5x+9. Estimate y when x=52. [U6-M07-Q33] [2 marks]

14. A scatter graph shows points rising closely from left to right. Describe correlation and what it means. [U6-M07-Q34] [3 marks]

15. A line of best fit passes through (14,54) and (36,84). Find its equation. [U6-M07-Q35] [4 marks]

MODULE 07 / S6

Scatter Graphs, Correlation, Best Fit and Prediction

GRADE 7-9 CHALLENGE • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Extended reasoning. Plan the model before calculating.

1. Use y=1.8x+5 to estimate x when y=95, and state whether this is interpolation if observed x-values are 10-50. [U6-M07-Q36] [4 marks]

2. Explain why extrapolating a scatter trend far beyond the observed range is dangerous (case 37). [U6-M07-Q37] [4 marks]

3. A hidden variable could explain correlation between ice-cream sales and sunburn cases. Name it and explain confounding. [U6-M07-Q38] [4 marks]

4. A point lies far from the pattern. Explain how it may affect the line of best fit and what should be checked (case 39). [U6-M07-Q39] [4 marks]

5. Design a scatter-graph investigation, naming explanatory/response variables and controls (variant 40). [U6-M07-Q40] [5 marks]

MODULE 07 / S6

Scatter Graphs, Correlation, Best Fit and Prediction

GRADE 7-9 CHALLENGE • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Complete the challenge set. Present a clear mathematical argument.

6. A line of best fit is y=1.5x+10. Estimate y when x=60. [U6-M07-Q41] [2 marks]

7. A scatter graph shows points rising closely from left to right. Describe correlation and what it means. [U6-M07-Q42] [3 marks]

8. A line of best fit passes through (12,62) and (30,92). Find its equation. [U6-M07-Q43] [4 marks]

9. Use y=1.8x+6 to estimate x when y=103, and state whether this is interpolation if observed x-values are 10-50. [U6-M07-Q44] [4 marks]

10. Explain why extrapolating a scatter trend far beyond the observed range is dangerous (case 45). [U6-M07-Q45] [4 marks]

MODULE 08 / S4,S5

Comparing Distributions, Skew and Statistical Conclusions

FLUENCY CHECK

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

A short prerequisite check. Work accurately, then move promptly to Higher demand.

1. Group A has median 40, IQR 12; Group B median 50, IQR 18. Compare. [U6-M08-Q01] [3 marks]

2. Group A has mean 61 and range 31; Group B has mean 59 and range 21. Compare the distributions and state one limitation. [U6-M08-Q02] [3 marks]

3. Two histograms have different sample sizes. Explain how to compare shapes fairly (case 3). [U6-M08-Q03] [4 marks]

4. One distribution is positively skewed. Predict the relative positions of mean and median and explain. [U6-M08-Q04] [4 marks]

5. Two distributions share mean and range. Explain why they need not have similar shapes (case 5). [U6-M08-Q05] [4 marks]

6. A report says “Group A performed better because its maximum is higher.” Critique the claim. [U6-M08-Q06] [4 marks]

7. Choose appropriate centre/spread measures for a strongly skewed income distribution and justify. [U6-M08-Q07] [3 marks]

8. **Write a complete comparative conclusion from two box plots without claiming causation (variant 8). [U6-M08-Q08]** **[4 marks]**

MODULE 08 / S4,S5

Comparing Distributions, Skew and Statistical Conclusions

STANDARD HIGHER • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Higher-tier application. Show the governing relationship and exact working.

1. Group A has median 41, IQR 15; Group B median 52, IQR 18. Compare. [U6-M08-Q09] [3 marks]

2. Group A has mean 61 and range 34; Group B has mean 61 and range 21. Compare the distributions and state one limitation. [U6-M08-Q10] [3 marks]

3. Two histograms have different sample sizes. Explain how to compare shapes fairly (case 11). [U6-M08-Q11] [4 marks]

4. One distribution is positively skewed. Predict the relative positions of mean and median and explain. [U6-M08-Q12] [4 marks]

5. Two distributions share mean and range. Explain why they need not have similar shapes (case 13). [U6-M08-Q13] [4 marks]

6. A report says “Group A performed better because its maximum is higher.” Critique the claim. [U6-M08-Q14] [4 marks]

MODULE 08 / S4,S5

Comparing Distributions, Skew and Statistical Conclusions

STANDARD HIGHER • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Continue the Higher set. Interpret each result in context.

7. Choose appropriate centre/spread measures for a strongly skewed income distribution and justify. [U6-M08-Q15] [3 marks]

8. Write a complete comparative conclusion from two box plots without claiming causation (variant 16). [U6-M08-Q16] [4 marks]

9. Group A has median 42, IQR 13; Group B median 54, IQR 18. Compare. [U6-M08-Q17] [3 marks]

10. Group A has mean 61 and range 32; Group B has mean 63 and range 21. Compare the distributions and state one limitation. [U6-M08-Q18] [3 marks]

11. Two histograms have different sample sizes. Explain how to compare shapes fairly (case 19). [U6-M08-Q19] [4 marks]

12. One distribution is positively skewed. Predict the relative positions of mean and median and explain. [U6-M08-Q20] [4 marks]

MODULE 08 / S4,S5

Comparing Distributions, Skew and Statistical Conclusions

MULTI-STEP HIGHER • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Original multi-step exam-style questions. Show every connected stage.

1. Two distributions share mean and range. Explain why they need not have similar shapes (case 21). [U6-M08-Q21] [4 marks]

2. A report says “Group A performed better because its maximum is higher.” Critique the claim. [U6-M08-Q22] [4 marks]

3. Choose appropriate centre/spread measures for a strongly skewed income distribution and justify. [U6-M08-Q23] [3 marks]

4. Write a complete comparative conclusion from two box plots without claiming causation (variant 24). [U6-M08-Q24] [4 marks]

5. Group A has median 43, IQR 16; Group B median 50, IQR 18. Compare. [U6-M08-Q25] [3 marks]

MODULE 08 / S4,S5

Comparing Distributions, Skew and Statistical Conclusions

MULTI-STEP HIGHER • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Continue the multi-step set. Explain decisions where requested.

6. **Group A has mean 61 and range 30; Group B has mean 59 and range 21. Compare the distributions and state one limitation. [U6-M08-Q26]** [3 marks]

7. **Two histograms have different sample sizes. Explain how to compare shapes fairly (case 27). [U6-M08-Q27]** [4 marks]

8. **One distribution is positively skewed. Predict the relative positions of mean and median and explain. [U6-M08-Q28]** [4 marks]

9. **Two distributions share mean and range. Explain why they need not have similar shapes (case 29). [U6-M08-Q29]** [4 marks]

10. **A report says “Group A performed better because its maximum is higher.” Critique the claim. [U6-M08-Q30]** [4 marks]

MODULE 08 / S4,S5

Comparing Distributions, Skew and Statistical Conclusions

MULTI-STEP HIGHER • PART C

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Complete the multi-step set. Check units, accuracy and reasonableness.

11. **Choose appropriate centre/spread measures for a strongly skewed income distribution and justify. [U6-M08-Q31]** [3 marks]

12. **Write a complete comparative conclusion from two box plots without claiming causation (variant 32). [U6-M08-Q32]** [4 marks]

13. **Group A has median 44, IQR 14; Group B median 52, IQR 18. Compare. [U6-M08-Q33]** [3 marks]

14. **Group A has mean 61 and range 33; Group B has mean 61 and range 21. Compare the distributions and state one limitation. [U6-M08-Q34]** [3 marks]

15. **Two histograms have different sample sizes. Explain how to compare shapes fairly (case 35). [U6-M08-Q35]** [4 marks]

MODULE 08 / S4,S5

Comparing Distributions, Skew and Statistical Conclusions

GRADE 7-9 CHALLENGE • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Extended reasoning. Plan the model before calculating.

1. One distribution is positively skewed. Predict the relative positions of mean and median and explain. [U6-M08-Q36] [4 marks]

2. Two distributions share mean and range. Explain why they need not have similar shapes (case 37). [U6-M08-Q37] [4 marks]

3. A report says “Group A performed better because its maximum is higher.” Critique the claim. [U6-M08-Q38] [4 marks]

4. Choose appropriate centre/spread measures for a strongly skewed income distribution and justify. [U6-M08-Q39] [3 marks]

5. Write a complete comparative conclusion from two box plots without claiming causation (variant 40). [U6-M08-Q40] [4 marks]

MODULE 08 / S4,S5

Comparing Distributions, Skew and Statistical Conclusions

GRADE 7-9 CHALLENGE • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Complete the challenge set. Present a clear mathematical argument.

6. **Group A has median 45, IQR 12; Group B median 54, IQR 18. Compare. [U6-M08-Q41]** **[3 marks]**

7. **Group A has mean 61 and range 31; Group B has mean 63 and range 21. Compare the distributions and state one limitation. [U6-M08-Q42]** **[3 marks]**

8. **Two histograms have different sample sizes. Explain how to compare shapes fairly (case 43). [U6-M08-Q43]** **[4 marks]**

9. **One distribution is positively skewed. Predict the relative positions of mean and median and explain. [U6-M08-Q44]** **[4 marks]**

10. **Two distributions share mean and range. Explain why they need not have similar shapes (case 45). [U6-M08-Q45]** **[4 marks]**

MODULE 09 / S1,S2,S4,S5

Missing Data, Corrections, Critique and Statistical Validity

FLUENCY CHECK

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

A short prerequisite check. Work accurately, then move promptly to Higher demand.

1. The mean of 10 values is 20. One recorded value 30 should be 25. Find the corrected mean. [U6-M09-Q01] [4 marks]

2. 11 values have mean 21; an additional value x gives new mean 22. Find x. [U6-M09-Q02] [4 marks]

3. A frequency table has values 1,2,3 with frequencies x,7,10; mean is 2. Find x. [U6-M09-Q03] [4 marks]

4. A chart omits 13% of responses labelled “other”. Explain the statistical problem. [U6-M09-Q04] [3 marks]

5. A survey has non-response of 24%. Explain possible non-response bias and a remedy. [U6-M09-Q05] [4 marks]

6. A model predicts a population mean from a convenience sample. List a four-part validity audit (variant 6). [U6-M09-Q06] [4 marks]

7. Explain how rounding individual data before averaging can affect the result (case 7). [U6-M09-Q07] [4 marks]

8. **A statistical claim uses a relative increase but omits the baseline. Explain why this can mislead (case 8). [U6-M09-Q08]** **[4 marks]**

MODULE 09 / S1,S2,S4,S5

Missing Data, Corrections, Critique and Statistical Validity

STANDARD HIGHER • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Higher-tier application. Show the governing relationship and exact working.

1. The mean of 10 values is 21. One recorded value 38 should be 33. Find the corrected mean. [U6-M09-Q09] [4 marks]

2. 11 values have mean 22; an additional value x gives new mean 23. Find x. [U6-M09-Q10] [4 marks]

3. A frequency table has values 1,2,3 with frequencies x,5,12; mean is 2. Find x. [U6-M09-Q11] [4 marks]

4. A chart omits 21% of responses labelled “other”. Explain the statistical problem. [U6-M09-Q12] [3 marks]

5. A survey has non-response of 32%. Explain possible non-response bias and a remedy. [U6-M09-Q13] [4 marks]

6. A model predicts a population mean from a convenience sample. List a four-part validity audit (variant 14). [U6-M09-Q14] [4 marks]

MODULE 09 / S1,S2,S4,S5

Missing Data, Corrections, Critique and Statistical Validity

STANDARD HIGHER • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Continue the Higher set. Interpret each result in context.

7. Explain how rounding individual data before averaging can affect the result (case 15). [U6-M09-Q15] [4 marks]

8. A statistical claim uses a relative increase but omits the baseline. Explain why this can mislead (case 16). [U6-M09-Q16] [4 marks]

9. The mean of 10 values is 22. One recorded value 46 should be 41. Find the corrected mean. [U6-M09-Q17] [4 marks]

10. 11 values have mean 23; an additional value x gives new mean 24. Find x. [U6-M09-Q18] [4 marks]

11. A frequency table has values 1,2,3 with frequencies x,8,8; mean is 2. Find x. [U6-M09-Q19] [4 marks]

12. A chart omits 29% of responses labelled “other”. Explain the statistical problem. [U6-M09-Q20] [3 marks]

MODULE 09 / S1,S2,S4,S5

Missing Data, Corrections, Critique and Statistical Validity

MULTI-STEP HIGHER • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Original multi-step exam-style questions. Show every connected stage.

1. A survey has non-response of 20%. Explain possible non-response bias and a remedy. [U6-M09-Q21] [4 marks]

2. A model predicts a population mean from a convenience sample. List a four-part validity audit (variant 22). [U6-M09-Q22] [4 marks]

3. Explain how rounding individual data before averaging can affect the result (case 23). [U6-M09-Q23] [4 marks]

4. A statistical claim uses a relative increase but omits the baseline. Explain why this can mislead (case 24). [U6-M09-Q24] [4 marks]

5. The mean of 10 values is 23. One recorded value 54 should be 49. Find the corrected mean. [U6-M09-Q25] [4 marks]

MODULE 09 / S1,S2,S4,S5

Missing Data, Corrections, Critique and Statistical Validity

MULTI-STEP HIGHER • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Continue the multi-step set. Explain decisions where requested.

6. **11 values have mean 24; an additional value x gives new mean 25. Find x. [U6-M09-Q26]** **[4 marks]**

7. **A frequency table has values 1,2,3 with frequencies x,6,10; mean is 2. Find x. [U6-M09-Q27]** **[4 marks]**

8. **A chart omits 37% of responses labelled “other”. Explain the statistical problem. [U6-M09-Q28]** **[3 marks]**

9. **A survey has non-response of 28%. Explain possible non-response bias and a remedy. [U6-M09-Q29]** **[4 marks]**

10. **A model predicts a population mean from a convenience sample. List a four-part validity audit (variant 30). [U6-M09-Q30]** **[4 marks]**

MODULE 09 / S1,S2,S4,S5

Missing Data, Corrections, Critique and Statistical Validity

MULTI-STEP HIGHER • PART C

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Complete the multi-step set. Check units, accuracy and reasonableness.

11. Explain how rounding individual data before averaging can affect the result (case 31). [U6-M09-Q31] [4 marks]

12. A statistical claim uses a relative increase but omits the baseline. Explain why this can mislead (case 32). [U6-M09-Q32] [4 marks]

13. The mean of 10 values is 24. One recorded value 62 should be 57. Find the corrected mean. [U6-M09-Q33] [4 marks]

14. 11 values have mean 25; an additional value x gives new mean 26. Find x. [U6-M09-Q34] [4 marks]

15. A frequency table has values 1,2,3 with frequencies x,9,12; mean is 2. Find x. [U6-M09-Q35] [4 marks]

MODULE 09 / S1,S2,S4,S5

Missing Data, Corrections, Critique and Statistical Validity

GRADE 7-9 CHALLENGE • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Extended reasoning. Plan the model before calculating.

1. A chart omits 45% of responses labelled “other”. Explain the statistical problem. [U6-M09-Q36] [3 marks]

2. A survey has non-response of 36%. Explain possible non-response bias and a remedy. [U6-M09-Q37] [4 marks]

3. A model predicts a population mean from a convenience sample. List a four-part validity audit (variant 38). [U6-M09-Q38] [4 marks]

4. Explain how rounding individual data before averaging can affect the result (case 39). [U6-M09-Q39] [4 marks]

5. A statistical claim uses a relative increase but omits the baseline. Explain why this can mislead (case 40). [U6-M09-Q40] [4 marks]

MODULE 09 / S1,S2,S4,S5

Missing Data, Corrections, Critique and Statistical Validity

GRADE 7-9 CHALLENGE • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Complete the challenge set. Present a clear mathematical argument.

6. **The mean of 10 values is 25. One recorded value 70 should be 65. Find the corrected mean. [U6-M09-Q41]** **[4 marks]**

7. **11 values have mean 26; an additional value x gives new mean 27. Find x. [U6-M09-Q42]** **[4 marks]**

8. **A frequency table has values 1,2,3 with frequencies x,7,8; mean is 2. Find x. [U6-M09-Q43]** **[4 marks]**

9. **A chart omits 53% of responses labelled “other”. Explain the statistical problem. [U6-M09-Q44]** **[3 marks]**

10. **A survey has non-response of 24%. Explain possible non-response bias and a remedy. [U6-M09-Q45]** **[4 marks]**

MODULE 10 / S1-S6 synthesis

Mixed Higher Statistics Problem Solving

FLUENCY CHECK

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

A short prerequisite check. Work accurately, then move promptly to Higher demand.

1. A college has three year groups of sizes [240, 360, 400]. Design a stratified sample of 100 students and explain one safeguard against bias. [U6-M10-Q01] **[5 marks]**

2. Values [12, 18, 25] have frequencies [5, 8, 7]. Find the mean, then find the new mean if every value is increased by 4 and doubled. [U6-M10-Q02] **[5 marks]**

3. Grouped classes 0-<10, 10-<20, 20-<30 and 30-<40 have frequencies [6, 10, 8, 4]. Estimate the mean and identify the median class. [U6-M10-Q03] **[5 marks]**

4. A histogram has class widths [5, 10, 15] and frequencies [10, 20, 30]. Calculate all frequency densities and state which bar is tallest. [U6-M10-Q04] **[4 marks]**

5. A cumulative-frequency graph represents 120 values and gives Q1=18, median=28, Q3=42. Find the IQR and estimate how many observations lie between Q1 and Q3. Explain the estimate. [U6-M10-Q05] **[4 marks]**

6. A line of best fit passes through (10,25) and (30,55). Find its equation and estimate y when x=20. State whether this is interpolation. [U6-M10-Q06] **[5 marks]**

7. **Two box plots give A: median 40, IQR 10; B: median 44, IQR 16. Write a complete comparison and name one feature a box plot does not show. [U6-M10-Q07]** **[4 marks]**

8. **The mean of 12 recorded values is 24. One value was entered as 40 instead of 32. Find the corrected mean and explain why the number of values is unchanged. [U6-M10-Q08]** **[4 marks]**

MODULE 10 / S1-S6 synthesis

Mixed Higher Statistics Problem Solving

STANDARD HIGHER • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Higher-tier application. Show the governing relationship and exact working.

1. A report says a result rose from 50 to 58, but displays a vertical axis beginning at 48. Calculate the percentage increase and evaluate the presentation. [U6-M10-Q09] [4 marks]

2. A college has three year groups of sizes [260, 380, 410]. Design a stratified sample of 110 students and explain one safeguard against bias. [U6-M10-Q10] [5 marks]

3. Values [13, 19, 26] have frequencies [6, 9, 8]. Find the mean, then find the new mean if every value is increased by 4 and doubled. [U6-M10-Q11] [5 marks]

4. Grouped classes 0-<10, 10-<20, 20-<30 and 30-<40 have frequencies [7, 11, 9, 5]. Estimate the mean and identify the median class. [U6-M10-Q12] [5 marks]

5. A histogram has class widths [5, 10, 15] and frequencies [15, 25, 35]. Calculate all frequency densities and state which bar is tallest. [U6-M10-Q13] [4 marks]

6. A cumulative-frequency graph represents 140 values and gives Q1=19, median=30, Q3=44. Find the IQR and estimate how many observations lie between Q1 and Q3. Explain the estimate. [U6-M10-Q14] [4 marks]

MODULE 10 / S1-S6 synthesis

Mixed Higher Statistics Problem Solving

STANDARD HIGHER • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Continue the Higher set. Interpret each result in context.

7. A line of best fit passes through (11,27) and (31,57). Find its equation and estimate y when x=21. State whether this is interpolation. [U6-M10-Q15] [5 marks]

8. Two box plots give A: median 42, IQR 11; B: median 45, IQR 17. Write a complete comparison and name one feature a box plot does not show. [U6-M10-Q16] [4 marks]

9. The mean of 13 recorded values is 25. One value was entered as 41 instead of 33. Find the corrected mean and explain why the number of values is unchanged. [U6-M10-Q17] [4 marks]

10. A report says a result rose from 55 to 64, but displays a vertical axis beginning at 53. Calculate the percentage increase and evaluate the presentation. [U6-M10-Q18] [4 marks]

11. A college has three year groups of sizes [280, 400, 420]. Design a stratified sample of 120 students and explain one safeguard against bias. [U6-M10-Q19] [5 marks]

12. Values [14, 20, 27] have frequencies [7, 10, 9]. Find the mean, then find the new mean if every value is increased by 4 and doubled. [U6-M10-Q20] [5 marks]

MODULE 10 / S1-S6 synthesis

Mixed Higher Statistics Problem Solving

MULTI-STEP HIGHER • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Original multi-step exam-style questions. Show every connected stage.

1. Grouped classes 0-<10, 10-<20, 20-<30 and 30-<40 have frequencies [8, 12, 10, 6]. Estimate the mean and identify the median class. [U6-M10-Q21] **[5 marks]**

2. A histogram has class widths [5, 10, 15] and frequencies [20, 30, 40]. Calculate all frequency densities and state which bar is tallest. [U6-M10-Q22] **[4 marks]**

3. A cumulative-frequency graph represents 160 values and gives Q1=20, median=32, Q3=46. Find the IQR and estimate how many observations lie between Q1 and Q3. Explain the estimate. [U6-M10-Q23] **[4 marks]**

4. A line of best fit passes through (12,29) and (32,59). Find its equation and estimate y when x=22. State whether this is interpolation. [U6-M10-Q24] **[5 marks]**

5. Two box plots give A: median 44, IQR 12; B: median 46, IQR 18. Write a complete comparison and name one feature a box plot does not show. [U6-M10-Q25] **[4 marks]**

MODULE 10 / S1-S6 synthesis

Mixed Higher Statistics Problem Solving

MULTI-STEP HIGHER • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Continue the multi-step set. Explain decisions where requested.

6. **The mean of 14 recorded values is 26. One value was entered as 42 instead of 34. Find the corrected mean and explain why the number of values is unchanged. [U6-M10-Q26]** **[4 marks]**

7. **A report says a result rose from 60 to 70, but displays a vertical axis beginning at 58. Calculate the percentage increase and evaluate the presentation. [U6-M10-Q27]** **[4 marks]**

8. **A college has three year groups of sizes [300, 420, 430]. Design a stratified sample of 130 students and explain one safeguard against bias. [U6-M10-Q28]** **[5 marks]**

9. **Values [15, 21, 28] have frequencies [8, 11, 10]. Find the mean, then find the new mean if every value is increased by 4 and doubled. [U6-M10-Q29]** **[5 marks]**

10. **Grouped classes 0-<10, 10-<20, 20-<30 and 30-<40 have frequencies [9, 13, 11, 7]. Estimate the mean and identify the median class. [U6-M10-Q30]** **[5 marks]**

MODULE 10 / S1-S6 synthesis

Mixed Higher Statistics Problem Solving

MULTI-STEP HIGHER • PART C

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Complete the multi-step set. Check units, accuracy and reasonableness.

11. A histogram has class widths [5, 10, 15] and frequencies [25, 35, 45]. Calculate all frequency densities and state which bar is tallest. [U6-M10-Q31] [4 marks]

12. A cumulative-frequency graph represents 180 values and gives Q1=21, median=34, Q3=48. Find the IQR and estimate how many observations lie between Q1 and Q3. Explain the estimate. [U6-M10-Q32] [4 marks]

13. A line of best fit passes through (13,31) and (33,61). Find its equation and estimate y when x=23. State whether this is interpolation. [U6-M10-Q33] [5 marks]

14. Two box plots give A: median 46, IQR 13; B: median 47, IQR 19. Write a complete comparison and name one feature a box plot does not show. [U6-M10-Q34] [4 marks]

15. The mean of 15 recorded values is 27. One value was entered as 43 instead of 35. Find the corrected mean and explain why the number of values is unchanged. [U6-M10-Q35] [4 marks]

MODULE 10 / S1-S6 synthesis

Mixed Higher Statistics Problem Solving

GRADE 7-9 CHALLENGE • PART A

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Extended reasoning. Plan the model before calculating.

1. A report says a result rose from 65 to 76, but displays a vertical axis beginning at 63. Calculate the percentage increase and evaluate the presentation. [U6-M10-Q36] [4 marks]

2. A college has three year groups of sizes [320, 440, 440]. Design a stratified sample of 140 students and explain one safeguard against bias. [U6-M10-Q37] [5 marks]

3. Values [16, 22, 29] have frequencies [9, 12, 11]. Find the mean, then find the new mean if every value is increased by 4 and doubled. [U6-M10-Q38] [5 marks]

4. Grouped classes 0-<10, 10-<20, 20-<30 and 30-<40 have frequencies [10, 14, 12, 8]. Estimate the mean and identify the median class. [U6-M10-Q39] [5 marks]

5. A histogram has class widths [5, 10, 15] and frequencies [30, 40, 50]. Calculate all frequency densities and state which bar is tallest. [U6-M10-Q40] [4 marks]

MODULE 10 / S1-S6 synthesis

Mixed Higher Statistics Problem Solving

GRADE 7-9 CHALLENGE • PART B

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Complete the challenge set. Present a clear mathematical argument.

6. A cumulative-frequency graph represents 200 values and gives Q1=22, median=36, Q3=50. Find the IQR and estimate how many observations lie between Q1 and Q3. Explain the estimate. [U6-M10-Q41] [4 marks]

7. A line of best fit passes through (14,33) and (34,63). Find its equation and estimate y when x=24. State whether this is interpolation. [U6-M10-Q42] [5 marks]

8. Two box plots give A: median 48, IQR 14; B: median 48, IQR 20. Write a complete comparison and name one feature a box plot does not show. [U6-M10-Q43] [4 marks]

9. The mean of 16 recorded values is 28. One value was entered as 44 instead of 36. Find the corrected mean and explain why the number of values is unchanged. [U6-M10-Q44] [4 marks]

10. A report says a result rose from 70 to 82, but displays a vertical axis beginning at 68. Calculate the percentage increase and evaluate the presentation. [U6-M10-Q45] [4 marks]

MODULE 01 / S1,S5

Sampling, Data Collection, Bias and Population Inference

FORMULAS AND METHOD BANK

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use these methods before checking the answer tables. Write the setup first, substitute values, calculate, then give a final answer with units.

When to use it	Formula / method
Random sample	Every member has a known/equal selection chance.
Systematic	Random start, then every kth member.
Stratified	sample×stratum/population.
Bias	Check frame, timing, non-response and wording.
Inference	Generalise only from a representative sample.
Questionnaires	Neutral wording; exhaustive non-overlapping responses.

Marking reminder: a correct setup can earn method marks even when a later arithmetic error occurs.

MODULE 02 / S4

Averages, Quartiles, Spread, Outliers and Algebra

FORMULAS AND METHOD BANK

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use these methods before checking the answer tables. Write the setup first, substitute values, calculate, then give a final answer with units.

When to use it	Formula / method
Mean	Σx/n.
Combined mean	combined totals/combined frequencies.
Range	maximum-minimum.
IQR	Q3-Q1.
Outlier fences	Q1-1.5IQR and Q3+1.5IQR.
Choice	Median/IQR resist outliers; mean/range do not.

Marking reminder: a correct setup can earn method marks even when a later arithmetic error occurs.

MODULE 03 / S2,S4

Frequency Tables, Grouped Data and Estimated Means

FORMULAS AND METHOD BANK

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use these methods before checking the answer tables. Write the setup first, substitute values, calculate, then give a final answer with units.

When to use it	Formula / method
Frequency mean	Σfx/Σf.
Grouped estimate	Use class midpoints for x.
Median class	Locate N/2 in cumulative frequency.
Modal class	Greatest frequency unless a histogram/density context.
Boundaries	Use continuous class boundaries where appropriate.
Comparison	Compare centre and spread separately.

Marking reminder: a correct setup can earn method marks even when a later arithmetic error occurs.

MODULE 04 / S2,S4

Statistical Diagrams, Time Series and Misleading Graphs

FORMULAS AND METHOD BANK

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use these methods before checking the answer tables. Write the setup first, substitute values, calculate, then give a final answer with units.

When to use it	Formula / method
Pie angle	frequency/total×360°.
Time series	Plot in time order; line graph shows change.
Moving average	Average consecutive values and centre the result.
Chart choice	Match diagram to data type and purpose.
Fair comparison	Use common scales/proportions for unequal totals.
Misleading graphs	Check axes, intervals, area/volume effects and omissions.

Marking reminder: a correct setup can earn method marks even when a later arithmetic error occurs.

MODULE 05 / S3,S4

Cumulative Frequency, Quartiles and Box Plots

FORMULAS AND METHOD BANK

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use these methods before checking the answer tables. Write the setup first, substitute values, calculate, then give a final answer with units.

When to use it	Formula / method
Quartile positions	N/4, N/2, 3N/4.
Cumulative graph	Plot cumulative total at upper boundary.
Above a value	N-CF(value).
IQR	Q3-Q1.
Box plot	Five-number summary on a linear scale.
Compare	Median for centre; IQR/range for spread.

Marking reminder: a correct setup can earn method marks even when a later arithmetic error occurs.

MODULE 06 / S3,S4

Histograms and Frequency Density

FORMULAS AND METHOD BANK

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use these methods before checking the answer tables. Write the setup first, substitute values, calculate, then give a final answer with units.

When to use it	Formula / method
Density	frequency/class width.
Frequency	density×class width.
Histogram	Bar area represents frequency.
Unequal intervals	Compare densities, not raw frequencies.
Boundaries	Bars span continuous class boundaries.
Scale	Use one linear frequency-density axis.

Marking reminder: a correct setup can earn method marks even when a later arithmetic error occurs.

MODULE 07 / S6

Scatter Graphs, Correlation, Best Fit and Prediction

FORMULAS AND METHOD BANK

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use these methods before checking the answer tables. Write the setup first, substitute values, calculate, then give a final answer with units.

When to use it	Formula / method
Correlation	Positive, negative or none; describe strength.
Best fit	Balance points above/below; follow the trend.
Interpolation	Prediction within observed range.
Extrapolation	Outside range; greater risk.
Causation	Correlation alone is insufficient.
Outlier	Investigate influence and data quality.

Marking reminder: a correct setup can earn method marks even when a later arithmetic error occurs.

MODULE 08 / S4,S5

Comparing Distributions, Skew and Statistical Conclusions

FORMULAS AND METHOD BANK

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use these methods before checking the answer tables. Write the setup first, substitute values, calculate, then give a final answer with units.

When to use it	Formula / method
Centre	Compare like with like: median or mean.
Spread	IQR, range and outliers.
Consistency	Smaller spread means more consistent.
Skew	Tail direction; mean is pulled toward tail.
Context	Include units and practical meaning.
Caution	Summary statistics do not show causation or full shape.

Marking reminder: a correct setup can earn method marks even when a later arithmetic error occurs.

MODULE 09 / S1,S2,S4,S5

Missing Data, Corrections, Critique and Statistical Validity

FORMULAS AND METHOD BANK

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use these methods before checking the answer tables. Write the setup first, substitute values, calculate, then give a final answer with units.

When to use it	Formula / method
Corrected mean	Adjust the total, then divide by unchanged n.
Added/removed value	Use total=mean×number.
Missing frequency	Form Σfx/Σf equation.
Validity	Audit population, sample, measurement and analysis.
Non-response	May create systematic bias.
Communication	Give baselines, units, sample sizes and limitations.

Marking reminder: a correct setup can earn method marks even when a later arithmetic error occurs.

MODULE 10 / S1-S6 synthesis

Mixed Higher Statistics Problem Solving

FORMULAS AND METHOD BANK

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use these methods before checking the answer tables. Write the setup first, substitute values, calculate, then give a final answer with units.

When to use it	Formula / method
Identify	Data type, population, sample and purpose.
Represent	Choose a suitable table/diagram.
Calculate	Show formula, substitution and units.
Compare	Centre and spread, both in context.
Interpret	Separate association from causation.
Evaluate	Discuss bias, uncertainty and limitations.

Marking reminder: a correct setup can earn method marks even when a later arithmetic error occurs.

MODULE 01 / S1,S5

Sampling, Data Collection, Bias and Population Inference

FLUENCY CHECK - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Give every member a unique number, use a random-number generator to select distinct numbers until the sample size is reached, and survey the corresponding members.	**3**	M1 setup; M1 process; A1 conclusion.
2	Systematic sampling. A periodic pattern in the ordered list could bias the sample; the list also needs complete population coverage.	**3**	M1 setup; M1 process; A1 conclusion.
3	Total=1024. Unrounded allocations are 24.609, 36.094, 59.297. Using the largest-remainder method gives 25, 36 and 59, which sum to 120.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	Location bias: only one gym. Time/selection bias: only people present and willing at 10 am. The sample excludes non-gym users and is not representative nationally.	**3**	M1 setup; M1 process; A1 conclusion.
5	Example: “In a typical week, approximately how many hours do you spend using a screen outside work/school?” Use exhaustive, non-overlapping intervals such as 0-<5, 5-<10, ..., 30+ and include “prefer not to say”.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	Estimated total=1050×23=24150. This assumes the sample is representative; sampling variation and bias may make the estimate inaccurate.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
7	Primary data are collected for the current purpose and can match definitions but cost time/money. Secondary data already exist and may be larger/cheaper, but definitions, age, quality or population may not match the study.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
8	Large size reduces random sampling variation but does not remove systematic bias. A large convenience, voluntary-response or under-covered sample may be precisely wrong.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 01 / S1,S5

Sampling, Data Collection, Bias and Population Inference

STANDARD HIGHER • PART A - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Give every member a unique number, use a random-number generator to select distinct numbers until the sample size is reached, and survey the corresponding members.	**3**	M1 setup; M1 process; A1 conclusion.
2	Systematic sampling. A periodic pattern in the ordered list could bias the sample; the list also needs complete population coverage.	**3**	M1 setup; M1 process; A1 conclusion.
3	Total=1120. Unrounded allocations are 22.321, 30.357, 47.321. Using the largest-remainder method gives 22, 31 and 47, which sum to 100.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	Location bias: only one gym. Time/selection bias: only people present and willing at 10 am. The sample excludes non-gym users and is not representative nationally.	**3**	M1 setup; M1 process; A1 conclusion.
5	Example: “In a typical week, approximately how many hours do you spend using a screen outside work/school?” Use exhaustive, non-overlapping intervals such as 0-<5, 5-<10, ..., 30+ and include “prefer not to say”.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	Estimated total=1450×22=31900. This assumes the sample is representative; sampling variation and bias may make the estimate inaccurate.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 01 / S1,S5

Sampling, Data Collection, Bias and Population Inference

STANDARD HIGHER • PART B - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
7	Primary data are collected for the current purpose and can match definitions but cost time/money. Secondary data already exist and may be larger/cheaper, but definitions, age, quality or population may not match the study.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
8	Large size reduces random sampling variation but does not remove systematic bias. A large convenience, voluntary-response or under-covered sample may be precisely wrong.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
9	Give every member a unique number, use a random-number generator to select distinct numbers until the sample size is reached, and survey the corresponding members.	**3**	M1 setup; M1 process; A1 conclusion.
10	Systematic sampling. A periodic pattern in the ordered list could bias the sample; the list also needs complete population coverage.	**3**	M1 setup; M1 process; A1 conclusion.
11	Total=1216. Unrounded allocations are 31.003, 39.770, 59.227. Using the largest-remainder method gives 31, 40 and 59, which sum to 130.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
12	Location bias: only one gym. Time/selection bias: only people present and willing at 10 am. The sample excludes non-gym users and is not representative nationally.	**3**	M1 setup; M1 process; A1 conclusion.

MODULE 01 / S1,S5

Sampling, Data Collection, Bias and Population Inference

MULTI-STEP HIGHER • PART A - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Example: “In a typical week, approximately how many hours do you spend using a screen outside work/school?” Use exhaustive, non-overlapping intervals such as 0-<5, 5-<10, ..., 30+ and include “prefer not to say”.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
2	Estimated total=1850×21=38850. This assumes the sample is representative; sampling variation and bias may make the estimate inaccurate.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
3	Primary data are collected for the current purpose and can match definitions but cost time/money. Secondary data already exist and may be larger/cheaper, but definitions, age, quality or population may not match the study.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	Large size reduces random sampling variation but does not remove systematic bias. A large convenience, voluntary-response or under-covered sample may be precisely wrong.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	Give every member a unique number, use a random-number generator to select distinct numbers until the sample size is reached, and survey the corresponding members.	**3**	M1 setup; M1 process; A1 conclusion.
6	Systematic sampling. A periodic pattern in the ordered list could bias the sample; the list also needs complete population coverage.	**3**	M1 setup; M1 process; A1 conclusion.
7	Total=1312. Unrounded allocations are 27.668, 33.872, 48.460. Using the largest-remainder method gives 28, 34 and 48, which sum to 110.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
8	Location bias: only one gym. Time/selection bias: only people present and willing at 10 am. The sample excludes non-gym users and is not representative nationally.	**3**	M1 setup; M1 process; A1 conclusion.

MODULE 01 / S1,S5

Sampling, Data Collection, Bias and Population Inference

MULTI-STEP HIGHER • PART B - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
9	Example: “In a typical week, approximately how many hours do you spend using a screen outside work/school?” Use exhaustive, non-overlapping intervals such as 0-<5, 5-<10, ..., 30+ and include “prefer not to say”.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
10	Estimated total=2250×20=45000. This assumes the sample is representative; sampling variation and bias may make the estimate inaccurate.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
11	Primary data are collected for the current purpose and can match definitions but cost time/money. Secondary data already exist and may be larger/cheaper, but definitions, age, quality or population may not match the study.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
12	Large size reduces random sampling variation but does not remove systematic bias. A large convenience, voluntary-response or under-covered sample may be precisely wrong.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
13	Give every member a unique number, use a random-number generator to select distinct numbers until the sample size is reached, and survey the corresponding members.	**3**	M1 setup; M1 process; A1 conclusion.
14	Systematic sampling. A periodic pattern in the ordered list could bias the sample; the list also needs complete population coverage.	**3**	M1 setup; M1 process; A1 conclusion.
15	Total=1408. Unrounded allocations are 36.790, 43.352, 59.858. Using the largest-remainder method gives 37, 43 and 60, which sum to 140.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 01 / S1,S5

Sampling, Data Collection, Bias and Population Inference

GRADE 7-9 CHALLENGE - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Location bias: only one gym. Time/selection bias: only people present and willing at 10 am. The sample excludes non-gym users and is not representative nationally.	**3**	M1 setup; M1 process; A1 conclusion.
2	Example: “In a typical week, approximately how many hours do you spend using a screen outside work/school?” Use exhaustive, non-overlapping intervals such as 0-<5, 5-<10, ..., 30+ and include “prefer not to say”.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
3	Estimated total=2650×19=50350. This assumes the sample is representative; sampling variation and bias may make the estimate inaccurate.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	Primary data are collected for the current purpose and can match definitions but cost time/money. Secondary data already exist and may be larger/cheaper, but definitions, age, quality or population may not match the study.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	Large size reduces random sampling variation but does not remove systematic bias. A large convenience, voluntary-response or under-covered sample may be precisely wrong.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	Give every member a unique number, use a random-number generator to select distinct numbers until the sample size is reached, and survey the corresponding members.	**3**	M1 setup; M1 process; A1 conclusion.
7	Systematic sampling. A periodic pattern in the ordered list could bias the sample; the list also needs complete population coverage.	**3**	M1 setup; M1 process; A1 conclusion.
8	Total=1504. Unrounded allocations are 32.713, 37.340, 49.947. Using the largest-remainder method gives 33, 37 and 50, which sum to 120.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
9	Location bias: only one gym. Time/selection bias: only people present and willing at 10 am. The sample excludes non-gym users and is not representative nationally.	**3**	M1 setup; M1 process; A1 conclusion.

10	Example: “In a typical week, approximately how many hours do you spend using a screen outside work/school?” Use exhaustive, non-overlapping intervals such as 0-<5, 5-<10, …, 30+ and include “prefer not to say”.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 02 / S4

Averages, Quartiles, Spread, Outliers and Algebra

FLUENCY CHECK - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Mean=65/6=10.8333. Range=18-4=14.	**2**	M1 method; A1 answer.
2	Total=mean×number=13×9=117.	**2**	M1 method; A1 answer.
3	Original total=264. New total=227 over 11 values; new mean=20.6.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	IQR=Q3-Q1=34-15=19. The middle 50% of values span this amount.	**3**	M1 setup; M1 process; A1 conclusion.
5	IQR=20. Lower fence=Q1-1.5IQR=-16; upper fence=Q3+1.5IQR=64.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	Combined mean=[65(25)+70(35)]/[60]=67.9.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
7	[x+(x+2)+(2x-1)+11]/4=10. Thus 4x+12=40 and x=7.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
8	Median and quartiles depend on positions, so extreme values have limited effect. Mean and range use magnitudes and can be distorted by outliers; median/IQR better describe a typical skewed distribution.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 02 / S4

Averages, Quartiles, Spread, Outliers and Algebra

STANDARD HIGHER • PART A - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Original total=nm. New total=3(nm)-5n=n(3m-5). Divide by n to obtain new mean 3m-5.	**5**	M1 setup; M2–M4 development; A1 conclusion.
2	Mean=79/6=13.1667. Range=22-8=14.	**2**	M1 method; A1 answer.
3	Total=mean×number=13×11=143.	**2**	M1 method; A1 answer.
4	Original total=275. New total=229 over 10 values; new mean=22.9.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	IQR=Q3-Q1=31-14=17. The middle 50% of values span this amount.	**3**	M1 setup; M1 process; A1 conclusion.
6	IQR=24. Lower fence=Q1-1.5IQR=-25; upper fence=Q3+1.5IQR=71.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 02 / S4

Averages, Quartiles, Spread, Outliers and Algebra

STANDARD HIGHER • PART B - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
7	Combined mean=[66(20)+74(35)]/[55]=71.1.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
8	[x+(x+2)+(2x-1)+10]/4=11. Thus 4x+11=44 and x=8.25.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
9	Median and quartiles depend on positions, so extreme values have limited effect. Mean and range use magnitudes and can be distorted by outliers; median/IQR better describe a typical skewed distribution.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
10	Original total=nm. New total=3(nm)-5n=n(3m-5). Divide by n to obtain new mean 3m-5.	**5**	M1 setup; M2–M4 development; A1 conclusion.
11	Mean=77/6=12.8333. Range=21-7=14.	**2**	M1 method; A1 answer.
12	Total=mean×number=13×13=169.	**2**	M1 method; A1 answer.

MODULE 02 / S4

Averages, Quartiles, Spread, Outliers and Algebra

MULTI-STEP HIGHER • PART A - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Original total=220. New total=165 over 9 values; new mean=18.3.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
2	IQR=Q3-Q1=34-13=21. The middle 50% of values span this amount.	**3**	M1 setup; M1 process; A1 conclusion.
3	IQR=22. Lower fence=Q1-1.5IQR=-19; upper fence=Q3+1.5IQR=69.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	Combined mean=[67(22)+73(35)]/[57]=70.7.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	[x+(x+2)+(2x-1)+14]/4=8. Thus 4x+15=32 and x=4.25.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	Median and quartiles depend on positions, so extreme values have limited effect. Mean and range use magnitudes and can be distorted by outliers; median/IQR better describe a typical skewed distribution.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
7	Original total=nm. New total=3(nm)-5n=n(3m-5). Divide by n to obtain new mean 3m-5.	**5**	M1 setup; M2–M4 development; A1 conclusion.
8	Mean=81/6=13.5. Range=20-6=14.	**2**	M1 method; A1 answer.

MODULE 02 / S4

Averages, Quartiles, Spread, Outliers and Algebra

MULTI-STEP HIGHER • PART B - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
9	Total=mean×number=13×8=104.	**2**	M1 method; A1 answer.
10	Original total=350. New total=286 over 13 values; new mean=22.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
11	IQR=Q3-Q1=31-12=19. The middle 50% of values span this amount.	**3**	M1 setup; M1 process; A1 conclusion.
12	IQR=26. Lower fence=Q1-1.5IQR=-28; upper fence=Q3+1.5IQR=76.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
13	Combined mean=[60(24)+72(35)]/[59]=67.1.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
14	[x+(x+2)+(2x-1)+13]/4=9. Thus 4x+14=36 and x=5.5.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
15	Median and quartiles depend on positions, so extreme values have limited effect. Mean and range use magnitudes and can be distorted by outliers; median/IQR better describe a typical skewed distribution.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 02 / S4

Averages, Quartiles, Spread, Outliers and Algebra

GRADE 7-9 CHALLENGE - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Original total=nm. New total=3(nm)-5n=n(3m-5). Divide by n to obtain new mean 3m-5.	**5**	M1 setup; M2–M4 development; A1 conclusion.
2	Mean=68/6=11.3333. Range=19-5=14.	**2**	M1 method; A1 answer.
3	Total=mean×number=13×10=130.	**2**	M1 method; A1 answer.
4	Original total=286. New total=213 over 12 values; new mean=17.8.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	IQR=Q3-Q1=34-16=18. The middle 50% of values span this amount.	**3**	M1 setup; M1 process; A1 conclusion.
6	IQR=16. Lower fence=Q1-1.5IQR=-10; upper fence=Q3+1.5IQR=54.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
7	Combined mean=[61(26)+71(35)]/[61]=66.7.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
8	[x+(x+2)+(2x-1)+12]/4=10. Thus 4x+13=40 and x=6.75.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
9	Median and quartiles depend on positions, so extreme values have limited effect. Mean and range use magnitudes and can be distorted by outliers; median/IQR better describe a typical skewed distribution.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
10	Original total=nm. New total=3(nm)-5n=n(3m-5). Divide by n to obtain new mean 3m-5.	**5**	M1 setup; M2–M4 development; A1 conclusion.

MODULE 03 / S2,S4

Frequency Tables, Grouped Data and Estimated Means

FLUENCY CHECK - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Σfx=80; Σf=30; mean=80/30=2.67.	**3**	M1 setup; M1 process; A1 conclusion.
2	Midpoints are [5, 15, 25, 35]. Σfx=730; Σf=34; estimated mean=21.5.	**3**	M1 setup; M1 process; A1 conclusion.
3	The exact observations are unknown. Every value in a class is represented by its midpoint, so the calculated total and mean need not equal the true values.	**3**	M1 setup; M1 process; A1 conclusion.
4	Using midpoints 5,15,25,35 gives (4×5+8×15+25x+6×35)/(18+x)=675/31. Cross-multiplying and simplifying gives x=13. Substitution gives Σfx=675, Σf=31 and estimated mean 675/31=675/31.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	The greatest frequency is 19, so the modal class is 15-<30. Total=38, so locate position 19. Cumulative frequencies are [5, 19, 38]; therefore the median class is 5-<15.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	For rounded continuous measurements, true values occupy intervals extending half a unit either side. Using continuous boundaries removes artificial gaps and supports correct widths, histograms and interpolation.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
7	The estimated mean is a weighted average of the midpoints with non-negative weights. A weighted average cannot be below every midpoint or above every midpoint, so it lies within their range.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
8	The second has the higher typical value by 3.4. The first has the smaller IQR and is more consistent. State both comparisons in context and note that grouped summaries are estimates.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 03 / S2,S4

Frequency Tables, Grouped Data and Estimated Means

STANDARD HIGHER • PART A - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Σfx=100; Σf=37; mean=100/37=2.7.	**3**	M1 setup; M1 process; A1 conclusion.
2	Midpoints are [5, 15, 25, 35]. Σfx=790; Σf=38; estimated mean=20.8.	**3**	M1 setup; M1 process; A1 conclusion.
3	The exact observations are unknown. Every value in a class is represented by its midpoint, so the calculated total and mean need not equal the true values.	**3**	M1 setup; M1 process; A1 conclusion.
4	Using midpoints 5,15,25,35 gives (4×5+8×15+25x+6×35)/(18+x)=625/29. Cross-multiplying and simplifying gives x=11. Substitution gives Σfx=625, Σf=29 and estimated mean 625/29=625/29.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	The greatest frequency is 15, so the modal class is 15-<30. Total=32, so locate position 16. Cumulative frequencies are [5, 17, 32]; therefore the median class is 5-<15.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	For rounded continuous measurements, true values occupy intervals extending half a unit either side. Using continuous boundaries removes artificial gaps and supports correct widths, histograms and interpolation.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 03 / S2,S4

Frequency Tables, Grouped Data and Estimated Means

STANDARD HIGHER • PART B - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
7	The estimated mean is a weighted average of the midpoints with non-negative weights. A weighted average cannot be below every midpoint or above every midpoint, so it lies within their range.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
8	The second has the higher typical value by 3.4. The first has the smaller IQR and is more consistent. State both comparisons in context and note that grouped summaries are estimates.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
9	$\Sigma fx=98$; $\Sigma f=36$; mean$=98/36=2.72$.	**3**	M1 setup; M1 process; A1 conclusion.
10	Midpoints are [5, 15, 25, 35]. $\Sigma fx=880$; $\Sigma f=40$; estimated mean$=22$.	**3**	M1 setup; M1 process; A1 conclusion.
11	The exact observations are unknown. Every value in a class is represented by its midpoint, so the calculated total and mean need not equal the true values.	**3**	M1 setup; M1 process; A1 conclusion.
12	Using midpoints 5,15,25,35 gives $(4\times5+8\times15+25x+6\times35)/(18+x)=175/8$. Cross-multiplying and simplifying gives $x=14$. Substitution gives $\Sigma fx=700$, $\Sigma f=32$ and estimated mean $700/32=175/8$.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 03 / S2,S4

Frequency Tables, Grouped Data and Estimated Means

MULTI-STEP HIGHER • PART A - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	The greatest frequency is 17, so the modal class is 15-<30. Total=32, so locate position 16. Cumulative frequencies are [5, 15, 32]; therefore the median class is 15-<30.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
2	For rounded continuous measurements, true values occupy intervals extending half a unit either side. Using continuous boundaries removes artificial gaps and supports correct widths, histograms and interpolation.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
3	The estimated mean is a weighted average of the midpoints with non-negative weights. A weighted average cannot be below every midpoint or above every midpoint, so it lies within their range.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	The second has the higher typical value by 3.4. The first has the smaller IQR and is more consistent. State both comparisons in context and note that grouped summaries are estimates.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	$\Sigma fx=88$; $\Sigma f=34$; mean=88/34=2.59.	**3**	M1 setup; M1 process; A1 conclusion.
6	Midpoints are [5, 15, 25, 35]. $\Sigma fx=715$; $\Sigma f=33$; estimated mean=21.7.	**3**	M1 setup; M1 process; A1 conclusion.
7	The exact observations are unknown. Every value in a class is represented by its midpoint, so the calculated total and mean need not equal the true values.	**3**	M1 setup; M1 process; A1 conclusion.
8	Using midpoints 5,15,25,35 gives $(4\times5+8\times15+25x+6\times35)/(18+x)=65/3$. Cross-multiplying and simplifying gives $x=12$. Substitution gives $\Sigma fx=650$, $\Sigma f=30$ and estimated mean 650/30=65/3.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 03 / S2,S4

Frequency Tables, Grouped Data and Estimated Means

MULTI-STEP HIGHER • PART B - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
9	The greatest frequency is 19, so the modal class is 15-<30. Total=37, so locate position 18.5. Cumulative frequencies are [5, 18, 37]; therefore the median class is 15-<30.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
10	For rounded continuous measurements, true values occupy intervals extending half a unit either side. Using continuous boundaries removes artificial gaps and supports correct widths, histograms and interpolation.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
11	The estimated mean is a weighted average of the midpoints with non-negative weights. A weighted average cannot be below every midpoint or above every midpoint, so it lies within their range.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
12	The second has the higher typical value by 3.4. The first has the smaller IQR and is more consistent. State both comparisons in context and note that grouped summaries are estimates.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
13	$\Sigma fx=98$; $\Sigma f=36$; mean=98/36=2.72.	**3**	M1 setup; M1 process; A1 conclusion.
14	Midpoints are [5, 15, 25, 35]. $\Sigma fx=775$; $\Sigma f=37$; estimated mean=20.9.	**3**	M1 setup; M1 process; A1 conclusion.
15	The exact observations are unknown. Every value in a class is represented by its midpoint, so the calculated total and mean need not equal the true values.	**3**	M1 setup; M1 process; A1 conclusion.

MODULE 03 / S2,S4

Frequency Tables, Grouped Data and Estimated Means

GRADE 7-9 CHALLENGE - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Using midpoints 5,15,25,35 gives (4×5+8×15+25x+6×35)/(18+x)=150/7. Cross-multiplying and simplifying gives x=10. Substitution gives Σfx=600, Σf=28 and estimated mean 600/28=150/7.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
2	The greatest frequency is 15, so the modal class is 15-<30. Total=31, so locate position 15.5. Cumulative frequencies are [5, 16, 31]; therefore the median class is 5-<15.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
3	For rounded continuous measurements, true values occupy intervals extending half a unit either side. Using continuous boundaries removes artificial gaps and supports correct widths, histograms and interpolation.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	The estimated mean is a weighted average of the midpoints with non-negative weights. A weighted average cannot be below every midpoint or above every midpoint, so it lies within their range.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	The second has the higher typical value by 3.4. The first has the smaller IQR and is more consistent. State both comparisons in context and note that grouped summaries are estimates.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	Σfx=96; Σf=35; mean=96/35=2.74.	**3**	M1 setup; M1 process; A1 conclusion.
7	Midpoints are [5, 15, 25, 35]. Σfx=865; Σf=39; estimated mean=22.2.	**3**	M1 setup; M1 process; A1 conclusion.
8	The exact observations are unknown. Every value in a class is represented by its midpoint, so the calculated total and mean need not equal the true values.	**3**	M1 setup; M1 process; A1 conclusion.
9	Using midpoints 5,15,25,35 gives (4×5+8×15+25x+6×35)/(18+x)=675/31. Cross-multiplying and simplifying gives x=13. Substitution gives Σfx=675, Σf=31 and estimated mean 675/31=675/31.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
10	The greatest frequency is 17, so the modal class is 15-<30. Total=36, so locate position 18. Cumulative frequencies are [5, 19, 36]; therefore the median class is 5-<15.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 04 / S2,S4

Statistical Diagrams, Time Series and Misleading Graphs

FLUENCY CHECK - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Angle=24/120×360=72°.	**2**	M1 method; A1 answer.
2	72/360=25/N, so N=25×360/72=125.	**3**	M1 setup; M1 process; A1 conclusion.
3	Averages: 23, 25.3333, 27.3333, 29.6667. Plot at the central time points.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	A centred moving average smooths short-term seasonal/random fluctuations, revealing the underlying trend. Compare actual values with the trend to estimate seasonal effects.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	A time-series line graph is appropriate because temperature is numerical and ordered through time; joining consecutive observations shows trend and seasonal movement. A histogram would discard time order.	**3**	M1 setup; M1 process; A1 conclusion.
6	The displayed height change occupies a large fraction of the truncated scale, exaggerating the visual effect. Show the full/clearly broken scale and report the actual absolute or percentage change.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
7	Equal angles mean equal proportions. The larger sample has twice the frequency in the corresponding category because its total is twice as large.	**3**	M1 setup; M1 process; A1 conclusion.
8	Use a comparative/percentage bar chart with a common 0-100% scale, consistent category colours, group labels and sample sizes. Comparing raw-frequency bars would confound group size with proportion.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 04 / S2,S4

Statistical Diagrams, Time Series and Misleading Graphs

STANDARD HIGHER • PART A - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Angle=32/168×360=68.6°.	**2**	M1 method; A1 answer.
2	72/360=33/N, so N=33×360/72=165.	**3**	M1 setup; M1 process; A1 conclusion.
3	Averages: 31, 33.3333, 35.3333, 37.6667. Plot at the central time points.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	A centred moving average smooths short-term seasonal/random fluctuations, revealing the underlying trend. Compare actual values with the trend to estimate seasonal effects.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	A time-series line graph is appropriate because temperature is numerical and ordered through time; joining consecutive observations shows trend and seasonal movement. A histogram would discard time order.	**3**	M1 setup; M1 process; A1 conclusion.
6	The displayed height change occupies a large fraction of the truncated scale, exaggerating the visual effect. Show the full/clearly broken scale and report the actual absolute or percentage change.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 04 / S2,S4

Statistical Diagrams, Time Series and Misleading Graphs

STANDARD HIGHER • PART B - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
7	Equal angles mean equal proportions. The larger sample has twice the frequency in the corresponding category because its total is twice as large.	**3**	M1 setup; M1 process; A1 conclusion.
8	Use a comparative/percentage bar chart with a common 0-100% scale, consistent category colours, group labels and sample sizes. Comparing raw-frequency bars would confound group size with proportion.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
9	Angle=40/216×360=66.7°.	**2**	M1 method; A1 answer.
10	72/360=41/N, so N=41×360/72=205.	**3**	M1 setup; M1 process; A1 conclusion.
11	Averages: 39, 41.3333, 43.3333, 45.6667. Plot at the central time points.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
12	A centred moving average smooths short-term seasonal/random fluctuations, revealing the underlying trend. Compare actual values with the trend to estimate seasonal effects.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 04 / S2,S4

Statistical Diagrams, Time Series and Misleading Graphs

MULTI-STEP HIGHER • PART A - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	A time-series line graph is appropriate because temperature is numerical and ordered through time; joining consecutive observations shows trend and seasonal movement. A histogram would discard time order.	**3**	M1 setup; M1 process; A1 conclusion.
2	The displayed height change occupies a large fraction of the truncated scale, exaggerating the visual effect. Show the full/clearly broken scale and report the actual absolute or percentage change.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
3	Equal angles mean equal proportions. The larger sample has twice the frequency in the corresponding category because its total is twice as large.	**3**	M1 setup; M1 process; A1 conclusion.
4	Use a comparative/percentage bar chart with a common 0-100% scale, consistent category colours, group labels and sample sizes. Comparing raw-frequency bars would confound group size with proportion.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	Angle=28/264×360=38.2°.	**2**	M1 method; A1 answer.
6	72/360=29/N, so N=29×360/72=145.	**3**	M1 setup; M1 process; A1 conclusion.
7	Averages: 47, 49.3333, 51.3333, 53.6667. Plot at the central time points.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
8	A centred moving average smooths short-term seasonal/random fluctuations, revealing the underlying trend. Compare actual values with the trend to estimate seasonal effects.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 04 / S2,S4

Statistical Diagrams, Time Series and Misleading Graphs

MULTI-STEP HIGHER • PART B - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
9	A time-series line graph is appropriate because temperature is numerical and ordered through time; joining consecutive observations shows trend and seasonal movement. A histogram would discard time order.	**3**	M1 setup; M1 process; A1 conclusion.
10	The displayed height change occupies a large fraction of the truncated scale, exaggerating the visual effect. Show the full/clearly broken scale and report the actual absolute or percentage change.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
11	Equal angles mean equal proportions. The larger sample has twice the frequency in the corresponding category because its total is twice as large.	**3**	M1 setup; M1 process; A1 conclusion.
12	Use a comparative/percentage bar chart with a common 0-100% scale, consistent category colours, group labels and sample sizes. Comparing raw-frequency bars would confound group size with proportion.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
13	Angle=36/312×360=41.5°.	**2**	M1 method; A1 answer.
14	72/360=37/N, so N=37×360/72=185.	**3**	M1 setup; M1 process; A1 conclusion.
15	Averages: 55, 57.3333, 59.3333, 61.6667. Plot at the central time points.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 04 / S2,S4

Statistical Diagrams, Time Series and Misleading Graphs

GRADE 7-9 CHALLENGE - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	A centred moving average smooths short-term seasonal/random fluctuations, revealing the underlying trend. Compare actual values with the trend to estimate seasonal effects.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
2	A time-series line graph is appropriate because temperature is numerical and ordered through time; joining consecutive observations shows trend and seasonal movement. A histogram would discard time order.	**3**	M1 setup; M1 process; A1 conclusion.
3	The displayed height change occupies a large fraction of the truncated scale, exaggerating the visual effect. Show the full/clearly broken scale and report the actual absolute or percentage change.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	Equal angles mean equal proportions. The larger sample has twice the frequency in the corresponding category because its total is twice as large.	**3**	M1 setup; M1 process; A1 conclusion.
5	Use a comparative/percentage bar chart with a common 0-100% scale, consistent category colours, group labels and sample sizes. Comparing raw-frequency bars would confound group size with proportion.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	Angle=24/360×360=24°.	**2**	M1 method; A1 answer.
7	72/360=25/N, so N=25×360/72=125.	**3**	M1 setup; M1 process; A1 conclusion.
8	Averages: 63, 65.3333, 67.3333, 69.6667. Plot at the central time points.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
9	A centred moving average smooths short-term seasonal/random fluctuations, revealing the underlying trend. Compare actual values with the trend to estimate seasonal effects.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
10	A time-series line graph is appropriate because temperature is numerical and ordered through time; joining consecutive observations shows trend and seasonal movement. A histogram would discard time order.	**3**	M1 setup; M1 process; A1 conclusion.

MODULE 05 / S3,S4

Cumulative Frequency, Quartiles and Box Plots

FLUENCY CHECK - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Use cumulative frequencies 25, 50 and 75, then read/interpolate the corresponding values.	**2**	M1 method; A1 answer.
2	Range=52. IQR=45-19=26.	**3**	M1 setup; M1 process; A1 conclusion.
3	The second group has the higher median and therefore higher typical value. Its IQR is smaller, so its middle 50% is more consistent. Give both statements in context.	**3**	M1 setup; M1 process; A1 conclusion.
4	Number exceeding 40=total-CF(40)=112-48=64.	**3**	M1 setup; M1 process; A1 conclusion.
5	This is halfway through the class frequency, so linear interpolation gives 20+½(10)=25. The estimate assumes values are evenly spread within the class.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	Box plots show five-number summaries but not sample size, modality, gaps or detailed shape. Different data sets can share the same box plot; use other graphs/context where these features matter.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
7	Cumulative frequency up to a class is plotted at the upper class boundary, not midpoint. Include a starting point of cumulative frequency 0 at the first lower boundary and join smoothly.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
8	Use one linear scale; draw the box from Q1 to Q3, median line inside, whiskers to minimum and maximum. Check the five values are ordered and label the axis/units.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 05 / S3,S4

Cumulative Frequency, Quartiles and Box Plots

STANDARD HIGHER • PART A - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Use cumulative frequencies 33, 66 and 99, then read/interpolate the corresponding values.	**2**	M1 method; A1 answer.
2	Range=57. IQR=45-20=25.	**3**	M1 setup; M1 process; A1 conclusion.
3	The second group has the higher median and therefore higher typical value. Its IQR is smaller, so its middle 50% is more consistent. Give both statements in context.	**3**	M1 setup; M1 process; A1 conclusion.
4	Number exceeding 40=total-CF(40)=144-56=88.	**3**	M1 setup; M1 process; A1 conclusion.
5	This is halfway through the class frequency, so linear interpolation gives 20+½(10)=25. The estimate assumes values are evenly spread within the class.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	Box plots show five-number summaries but not sample size, modality, gaps or detailed shape. Different data sets can share the same box plot; use other graphs/context where these features matter.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 05 / S3,S4

Cumulative Frequency, Quartiles and Box Plots

STANDARD HIGHER • PART B - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
7	Cumulative frequency up to a class is plotted at the upper class boundary, not midpoint. Include a starting point of cumulative frequency 0 at the first lower boundary and join smoothly.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
8	Use one linear scale; draw the box from Q1 to Q3, median line inside, whiskers to minimum and maximum. Check the five values are ordered and label the axis/units.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
9	Use cumulative frequencies 41, 82 and 123, then read/interpolate the corresponding values.	**2**	M1 method; A1 answer.
10	Range=57. IQR=45-21=24.	**3**	M1 setup; M1 process; A1 conclusion.
11	The second group has the higher median and therefore higher typical value. Its IQR is smaller, so its middle 50% is more consistent. Give both statements in context.	**3**	M1 setup; M1 process; A1 conclusion.
12	Number exceeding 40=total-CF(40)=176-64=112.	**3**	M1 setup; M1 process; A1 conclusion.

MODULE 05 / S3,S4

Cumulative Frequency, Quartiles and Box Plots

MULTI-STEP HIGHER • PART A - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	This is halfway through the class frequency, so linear interpolation gives 20+½(10)=25. The estimate assumes values are evenly spread within the class.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
2	Box plots show five-number summaries but not sample size, modality, gaps or detailed shape. Different data sets can share the same box plot; use other graphs/context where these features matter.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
3	Cumulative frequency up to a class is plotted at the upper class boundary, not midpoint. Include a starting point of cumulative frequency 0 at the first lower boundary and join smoothly.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	Use one linear scale; draw the box from Q1 to Q3, median line inside, whiskers to minimum and maximum. Check the five values are ordered and label the axis/units.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	Use cumulative frequencies 49, 98 and 147, then read/interpolate the corresponding values.	**2**	M1 method; A1 answer.
6	Range=57. IQR=45-22=23.	**3**	M1 setup; M1 process; A1 conclusion.
7	The second group has the higher median and therefore higher typical value. Its IQR is smaller, so its middle 50% is more consistent. Give both statements in context.	**3**	M1 setup; M1 process; A1 conclusion.
8	Number exceeding 40=total-CF(40)=208-72=136.	**3**	M1 setup; M1 process; A1 conclusion.

MODULE 05 / S3,S4

Cumulative Frequency, Quartiles and Box Plots

MULTI-STEP HIGHER • PART B - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
9	This is halfway through the class frequency, so linear interpolation gives 20+½(10)=25. The estimate assumes values are evenly spread within the class.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
10	Box plots show five-number summaries but not sample size, modality, gaps or detailed shape. Different data sets can share the same box plot; use other graphs/context where these features matter.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
11	Cumulative frequency up to a class is plotted at the upper class boundary, not midpoint. Include a starting point of cumulative frequency 0 at the first lower boundary and join smoothly.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
12	Use one linear scale; draw the box from Q1 to Q3, median line inside, whiskers to minimum and maximum. Check the five values are ordered and label the axis/units.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
13	Use cumulative frequencies 57, 114 and 171, then read/interpolate the corresponding values.	**2**	M1 method; A1 answer.
14	Range=52. IQR=45-23=22.	**3**	M1 setup; M1 process; A1 conclusion.
15	The second group has the higher median and therefore higher typical value. Its IQR is smaller, so its middle 50% is more consistent. Give both statements in context.	**3**	M1 setup; M1 process; A1 conclusion.

MODULE 05 / S3,S4

Cumulative Frequency, Quartiles and Box Plots

GRADE 7-9 CHALLENGE - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Number exceeding 40=total-CF(40)=240-80=160.	**3**	M1 setup; M1 process; A1 conclusion.
2	This is halfway through the class frequency, so linear interpolation gives 20+½(10)=25. The estimate assumes values are evenly spread within the class.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
3	Box plots show five-number summaries but not sample size, modality, gaps or detailed shape. Different data sets can share the same box plot; use other graphs/context where these features matter.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	Cumulative frequency up to a class is plotted at the upper class boundary, not midpoint. Include a starting point of cumulative frequency 0 at the first lower boundary and join smoothly.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	Use one linear scale; draw the box from Q1 to Q3, median line inside, whiskers to minimum and maximum. Check the five values are ordered and label the axis/units.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	Use cumulative frequencies 65, 130 and 195, then read/interpolate the corresponding values.	**2**	M1 method; A1 answer.
7	Range=52. IQR=45-24=21.	**3**	M1 setup; M1 process; A1 conclusion.
8	The second group has the higher median and therefore higher typical value. Its IQR is smaller, so its middle 50% is more consistent. Give both statements in context.	**3**	M1 setup; M1 process; A1 conclusion.
9	Number exceeding 40=total-CF(40)=272-88=184.	**3**	M1 setup; M1 process; A1 conclusion.
10	This is halfway through the class frequency, so linear interpolation gives 20+½(10)=25. The estimate assumes values are evenly spread within the class.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 06 / S3,S4

Histograms and Frequency Density

FLUENCY CHECK - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Density=frequency/class width=6/5=1.2.	**2**	M1 method; A1 answer.
2	Frequency=class width×density=10×1.3=13.	**3**	M1 setup; M1 process; A1 conclusion.
3	Densities=1.4, 1.4, 1.1. Bar area, not height alone, represents frequency.	**3**	M1 setup; M1 process; A1 conclusion.
4	Frequency/area=(18)/(33)=0.545. Apply the same factor to other bar areas.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	Frequencies are 3/5(44) and 2/5(44); both widths are 10. Densities=2.64 and 1.76.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	Bar area must represent frequency. With unequal widths, using frequency as height makes area proportional to frequency×width and exaggerates wide classes. Density=frequency/width corrects this.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
7	Reference density=12/10. Missing density=2×12/10; x=width×2×12/10=36.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
8	Histogram: continuous/grouped numerical data, touching bars, meaningful class widths, area represents frequency. Bar chart: categorical/discrete categories, separated bars, equal visual widths, height represents frequency.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 06 / S3,S4

Histograms and Frequency Density

STANDARD HIGHER • PART A - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Density=frequency/class width=14/5=2.8.	**2**	M1 method; A1 answer.
2	Frequency=class width×density=10×1.3=13.	**3**	M1 setup; M1 process; A1 conclusion.
3	Densities=1.8, 1.4, 1. Bar area, not height alone, represents frequency.	**3**	M1 setup; M1 process; A1 conclusion.
4	Frequency/area=(16)/(41)=0.39. Apply the same factor to other bar areas.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	Frequencies are 3/5(52) and 2/5(52); both widths are 10. Densities=3.12 and 2.08.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	Bar area must represent frequency. With unequal widths, using frequency as height makes area proportional to frequency×width and exaggerates wide classes. Density=frequency/width corrects this.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 06 / S3,S4

Histograms and Frequency Density

STANDARD HIGHER • PART B - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
7	Reference density=20/10. Missing density=2×20/10; x=width×2×20/10=60.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
8	Histogram: continuous/grouped numerical data, touching bars, meaningful class widths, area represents frequency. Bar chart: categorical/discrete categories, separated bars, equal visual widths, height represents frequency.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
9	Density=frequency/class width=22/5=4.4.	**2**	M1 method; A1 answer.
10	Frequency=class width×density=10×1.3=13.	**3**	M1 setup; M1 process; A1 conclusion.
11	Densities=1, 1.4, 1.4. Bar area, not height alone, represents frequency.	**3**	M1 setup; M1 process; A1 conclusion.
12	Frequency/area=(19)/(49)=0.388. Apply the same factor to other bar areas.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 06 / S3,S4

Histograms and Frequency Density

MULTI-STEP HIGHER • PART A - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Frequencies are 3/5(60) and 2/5(60); both widths are 10. Densities=3.6 and 2.4.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
2	Bar area must represent frequency. With unequal widths, using frequency as height makes area proportional to frequency×width and exaggerates wide classes. Density=frequency/width corrects this.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
3	Reference density=8/10. Missing density=2×8/10; x=width×2×8/10=24.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	Histogram: continuous/grouped numerical data, touching bars, meaningful class widths, area represents frequency. Bar chart: categorical/discrete categories, separated bars, equal visual widths, height represents frequency.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	Density=frequency/class width=10/5=2.	**2**	M1 method; A1 answer.
6	Frequency=class width×density=10×1.3=13.	**3**	M1 setup; M1 process; A1 conclusion.
7	Densities=1.4, 1.4, 1.3. Bar area, not height alone, represents frequency.	**3**	M1 setup; M1 process; A1 conclusion.
8	Frequency/area=(17)/(57)=0.298. Apply the same factor to other bar areas.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 06 / S3,S4

Histograms and Frequency Density

MULTI-STEP HIGHER • PART B - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
9	Frequencies are 3/5(68) and 2/5(68); both widths are 10. Densities=4.08 and 2.72.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
10	Bar area must represent frequency. With unequal widths, using frequency as height makes area proportional to frequency×width and exaggerates wide classes. Density=frequency/width corrects this.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
11	Reference density=16/10. Missing density=2×16/10; x=width×2×16/10=48.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
12	Histogram: continuous/grouped numerical data, touching bars, meaningful class widths, area represents frequency. Bar chart: categorical/discrete categories, separated bars, equal visual widths, height represents frequency.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
13	Density=frequency/class width=18/5=3.6.	**2**	M1 method; A1 answer.
14	Frequency=class width×density=10×1.3=13.	**3**	M1 setup; M1 process; A1 conclusion.
15	Densities=1.8, 1.4, 1.2. Bar area, not height alone, represents frequency.	**3**	M1 setup; M1 process; A1 conclusion.

MODULE 06 / S3,S4

Histograms and Frequency Density

GRADE 7-9 CHALLENGE - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Frequency/area=(15)/(65)=0.231. Apply the same factor to other bar areas.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
2	Frequencies are 3/5(76) and 2/5(76); both widths are 10. Densities=4.56 and 3.04.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
3	Bar area must represent frequency. With unequal widths, using frequency as height makes area proportional to frequency×width and exaggerates wide classes. Density=frequency/width corrects this.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	Reference density=24/10. Missing density=2×24/10; x=width×2×24/10=72.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	Histogram: continuous/grouped numerical data, touching bars, meaningful class widths, area represents frequency. Bar chart: categorical/discrete categories, separated bars, equal visual widths, height represents frequency.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	Density=frequency/class width=6/5=1.2.	**2**	M1 method; A1 answer.
7	Frequency=class width×density=10×1.3=13.	**3**	M1 setup; M1 process; A1 conclusion.
8	Densities=1, 1.4, 1.1. Bar area, not height alone, represents frequency.	**3**	M1 setup; M1 process; A1 conclusion.
9	Frequency/area=(18)/(73)=0.247. Apply the same factor to other bar areas.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
10	Frequencies are 3/5(84) and 2/5(84); both widths are 10. Densities=5.04 and 3.36.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 07 / S6

Scatter Graphs, Correlation, Best Fit and Prediction

FLUENCY CHECK - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	y=1.5(20)+5=35.	**2**	M1 method; A1 answer.
2	Strong positive correlation: larger values of one variable tend to be associated with larger values of the other. This does not by itself show causation.	**3**	M1 setup; M1 process; A1 conclusion.
3	Gradient=(52-22)/(32-12)=3/2. Using y=mx+c at (12,22), c=22-(3/2)(12)=4. Therefore y=3/2x+4.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	x=(63-8)/1.8=30.6. It is interpolation only if this x lies between 10 and 50; otherwise it is extrapolation.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	The relationship may change outside the observed range, the line is only an empirical approximation, and constraints may make predictions impossible. Extrapolated uncertainty grows and should be stated.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	Hot/sunny weather affects both ice-cream sales and sun exposure. The observed association does not show that buying ice cream causes sunburn; temperature/sunshine is a confounder.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
7	An outlier can pull the fitted line and alter predictions. Check recording/measurement error, investigate whether it belongs to a different population, but do not remove it without justification.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
8	Measure paired numerical data on the same units, put the plausible explanatory variable on x and response on y, use suitable scales, identify outliers and correlation, draw a balanced best-fit line, and avoid causal claims without design evidence.	**5**	M1 setup; M2–M4 development; A1 conclusion.

MODULE 07 / S6

Scatter Graphs, Correlation, Best Fit and Prediction

STANDARD HIGHER • PART A - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	y=1.5(28)+6=48.	**2**	M1 method; A1 answer.
2	Strong positive correlation: larger values of one variable tend to be associated with larger values of the other. This does not by itself show causation.	**3**	M1 setup; M1 process; A1 conclusion.
3	Gradient=(60-30)/(33-10)=30/23. Using y=mx+c at (10,30), c=30-(30/23)(10)=390/23. Therefore y=30/23x+390/23.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	x=(71-9)/1.8=34.4. It is interpolation only if this x lies between 10 and 50; otherwise it is extrapolation.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	The relationship may change outside the observed range, the line is only an empirical approximation, and constraints may make predictions impossible. Extrapolated uncertainty grows and should be stated.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	Hot/sunny weather affects both ice-cream sales and sun exposure. The observed association does not show that buying ice cream causes sunburn; temperature/sunshine is a confounder.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 07 / S6

Scatter Graphs, Correlation, Best Fit and Prediction

STANDARD HIGHER • PART B - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
7	An outlier can pull the fitted line and alter predictions. Check recording/measurement error, investigate whether it belongs to a different population, but do not remove it without justification.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
8	Measure paired numerical data on the same units, put the plausible explanatory variable on x and response on y, use suitable scales, identify outliers and correlation, draw a balanced best-fit line, and avoid causal claims without design evidence.	**5**	M1 setup; M2–M4 development; A1 conclusion.
9	$y=1.5(36)+7=61$.	**2**	M1 method; A1 answer.
10	Strong positive correlation: larger values of one variable tend to be associated with larger values of the other. This does not by itself show causation.	**3**	M1 setup; M1 process; A1 conclusion.
11	Gradient=(68-38)/(34-13)=10/7. Using y=mx+c at (13,38), c=38-(10/7)(13)=136/7. Therefore y=10/7x+136/7.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
12	x=(79-10)/1.8=38.3. It is interpolation only if this x lies between 10 and 50; otherwise it is extrapolation.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 07 / S6

Scatter Graphs, Correlation, Best Fit and Prediction

MULTI-STEP HIGHER • PART A - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	The relationship may change outside the observed range, the line is only an empirical approximation, and constraints may make predictions impossible. Extrapolated uncertainty grows and should be stated.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
2	Hot/sunny weather affects both ice-cream sales and sun exposure. The observed association does not show that buying ice cream causes sunburn; temperature/sunshine is a confounder.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
3	An outlier can pull the fitted line and alter predictions. Check recording/measurement error, investigate whether it belongs to a different population, but do not remove it without justification.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	Measure paired numerical data on the same units, put the plausible explanatory variable on x and response on y, use suitable scales, identify outliers and correlation, draw a balanced best-fit line, and avoid causal claims without design evidence.	**5**	M1 setup; M2–M4 development; A1 conclusion.
5	$y=1.5(44)+8=74$.	**2**	M1 method; A1 answer.
6	Strong positive correlation: larger values of one variable tend to be associated with larger values of the other. This does not by itself show causation.	**3**	M1 setup; M1 process; A1 conclusion.
7	Gradient $=(76-46)/(35-11)=5/4$. Using $y=mx+c$ at $(11,46)$, $c=46-(5/4)(11)=129/4$. Therefore $y=5/4x+129/4$.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
8	$x=(87-11)/1.8=42.2$. It is interpolation only if this x lies between 10 and 50; otherwise it is extrapolation.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 07 / S6

Scatter Graphs, Correlation, Best Fit and Prediction

MULTI-STEP HIGHER • PART B - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
9	The relationship may change outside the observed range, the line is only an empirical approximation, and constraints may make predictions impossible. Extrapolated uncertainty grows and should be stated.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
10	Hot/sunny weather affects both ice-cream sales and sun exposure. The observed association does not show that buying ice cream causes sunburn; temperature/sunshine is a confounder.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
11	An outlier can pull the fitted line and alter predictions. Check recording/measurement error, investigate whether it belongs to a different population, but do not remove it without justification.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
12	Measure paired numerical data on the same units, put the plausible explanatory variable on x and response on y, use suitable scales, identify outliers and correlation, draw a balanced best-fit line, and avoid causal claims without design evidence.	**5**	M1 setup; M2–M4 development; A1 conclusion.
13	$y=1.5(52)+9=87$.	**2**	M1 method; A1 answer.
14	Strong positive correlation: larger values of one variable tend to be associated with larger values of the other. This does not by itself show causation.	**3**	M1 setup; M1 process; A1 conclusion.
15	Gradient $=(84-54)/(36-14)=15/11$. Using $y=mx+c$ at $(14,54)$, $c=54-(15/11)(14)=384/11$. Therefore $y=15/11x+384/11$.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 07 / S6

Scatter Graphs, Correlation, Best Fit and Prediction

GRADE 7-9 CHALLENGE - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	x=(95-5)/1.8=50. It is interpolation only if this x lies between 10 and 50; otherwise it is extrapolation.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
2	The relationship may change outside the observed range, the line is only an empirical approximation, and constraints may make predictions impossible. Extrapolated uncertainty grows and should be stated.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
3	Hot/sunny weather affects both ice-cream sales and sun exposure. The observed association does not show that buying ice cream causes sunburn; temperature/sunshine is a confounder.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	An outlier can pull the fitted line and alter predictions. Check recording/measurement error, investigate whether it belongs to a different population, but do not remove it without justification.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	Measure paired numerical data on the same units, put the plausible explanatory variable on x and response on y, use suitable scales, identify outliers and correlation, draw a balanced best-fit line, and avoid causal claims without design evidence.	**5**	M1 setup; M2–M4 development; A1 conclusion.
6	y=1.5(60)+10=100.	**2**	M1 method; A1 answer.
7	Strong positive correlation: larger values of one variable tend to be associated with larger values of the other. This does not by itself show causation.	**3**	M1 setup; M1 process; A1 conclusion.
8	Gradient=(92-62)/(30-12)=5/3. Using y=mx+c at (12,62), c=62-(5/3)(12)=42. Therefore y=5/3x+42.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
9	x=(103-6)/1.8=53.9. It is interpolation only if this x lies between 10 and 50; otherwise it is extrapolation.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
10	The relationship may change outside the observed range, the line is only an empirical approximation, and constraints may make predictions impossible. Extrapolated uncertainty grows and should be stated.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 08 / S4,S5

Comparing Distributions, Skew and Statistical Conclusions

FLUENCY CHECK - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	B has the higher typical value by 10. A has the smaller IQR and is more consistent. Use “median” and “IQR” explicitly.	**3**	M1 setup; M1 process; A1 conclusion.
2	A has the higher mean by 2. Group B has the smaller range by 10 and is more consistent by this measure. Range uses only the two extremes and may be distorted by outliers.	**3**	M1 setup; M1 process; A1 conclusion.
3	Compare proportional/relative frequency density or normalise areas, and use the same class boundaries/scales where possible. Raw bar areas are confounded by sample size.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	The long high-value tail pulls the mean upward, so typically mean>median. The exact relationship depends on the data, but the median is more resistant to the tail.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	Mean and range are only two summaries. Data may differ in clustering, gaps, skew, modality, quartiles and outliers while retaining the same total/mean and extremes.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	One maximum describes a single extreme and may be an outlier. Compare representative centre (median/mean), spread (IQR/range), sample sizes and distribution shape before concluding.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
7	Use median and IQR because they resist extreme high incomes. Mean and range would be pulled by outliers and may not represent a typical person.	**3**	M1 setup; M1 process; A1 conclusion.
8	State which group has higher median, which has smaller IQR/range, quantify differences, mention overlap/outliers if shown, use contextual units, and limit the conclusion to association/descriptive comparison.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 08 / S4,S5

Comparing Distributions, Skew and Statistical Conclusions

STANDARD HIGHER • PART A - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	B has the higher typical value by 11. A has the smaller IQR and is more consistent. Use “median” and “IQR” explicitly.	**3**	M1 setup; M1 process; A1 conclusion.
2	Neither has the higher mean. Group B has the smaller range by 13 and is more consistent by this measure. Range uses only the two extremes and may be distorted by outliers.	**3**	M1 setup; M1 process; A1 conclusion.
3	Compare proportional/relative frequency density or normalise areas, and use the same class boundaries/scales where possible. Raw bar areas are confounded by sample size.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	The long high-value tail pulls the mean upward, so typically mean>median. The exact relationship depends on the data, but the median is more resistant to the tail.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	Mean and range are only two summaries. Data may differ in clustering, gaps, skew, modality, quartiles and outliers while retaining the same total/mean and extremes.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	One maximum describes a single extreme and may be an outlier. Compare representative centre (median/mean), spread (IQR/range), sample sizes and distribution shape before concluding.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 08 / S4,S5

Comparing Distributions, Skew and Statistical Conclusions

STANDARD HIGHER • PART B - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
7	Use median and IQR because they resist extreme high incomes. Mean and range would be pulled by outliers and may not represent a typical person.	**3**	M1 setup; M1 process; A1 conclusion.
8	State which group has higher median, which has smaller IQR/range, quantify differences, mention overlap/outliers if shown, use contextual units, and limit the conclusion to association/descriptive comparison.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
9	B has the higher typical value by 12. A has the smaller IQR and is more consistent. Use “median” and “IQR” explicitly.	**3**	M1 setup; M1 process; A1 conclusion.
10	B has the higher mean by 2. Group B has the smaller range by 11 and is more consistent by this measure. Range uses only the two extremes and may be distorted by outliers.	**3**	M1 setup; M1 process; A1 conclusion.
11	Compare proportional/relative frequency density or normalise areas, and use the same class boundaries/scales where possible. Raw bar areas are confounded by sample size.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
12	The long high-value tail pulls the mean upward, so typically mean>median. The exact relationship depends on the data, but the median is more resistant to the tail.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 08 / S4,S5

Comparing Distributions, Skew and Statistical Conclusions

MULTI-STEP HIGHER • PART A - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Mean and range are only two summaries. Data may differ in clustering, gaps, skew, modality, quartiles and outliers while retaining the same total/mean and extremes.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
2	One maximum describes a single extreme and may be an outlier. Compare representative centre (median/mean), spread (IQR/range), sample sizes and distribution shape before concluding.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
3	Use median and IQR because they resist extreme high incomes. Mean and range would be pulled by outliers and may not represent a typical person.	**3**	M1 setup; M1 process; A1 conclusion.
4	State which group has higher median, which has smaller IQR/range, quantify differences, mention overlap/outliers if shown, use contextual units, and limit the conclusion to association/descriptive comparison.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	B has the higher typical value by 7. A has the smaller IQR and is more consistent. Use “median” and “IQR” explicitly.	**3**	M1 setup; M1 process; A1 conclusion.
6	A has the higher mean by 2. Group B has the smaller range by 9 and is more consistent by this measure. Range uses only the two extremes and may be distorted by outliers.	**3**	M1 setup; M1 process; A1 conclusion.
7	Compare proportional/relative frequency density or normalise areas, and use the same class boundaries/scales where possible. Raw bar areas are confounded by sample size.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
8	The long high-value tail pulls the mean upward, so typically mean>median. The exact relationship depends on the data, but the median is more resistant to the tail.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 08 / S4,S5

Comparing Distributions, Skew and Statistical Conclusions

MULTI-STEP HIGHER • PART B - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
9	Mean and range are only two summaries. Data may differ in clustering, gaps, skew, modality, quartiles and outliers while retaining the same total/mean and extremes.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
10	One maximum describes a single extreme and may be an outlier. Compare representative centre (median/mean), spread (IQR/range), sample sizes and distribution shape before concluding.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
11	Use median and IQR because they resist extreme high incomes. Mean and range would be pulled by outliers and may not represent a typical person.	**3**	M1 setup; M1 process; A1 conclusion.
12	State which group has higher median, which has smaller IQR/range, quantify differences, mention overlap/outliers if shown, use contextual units, and limit the conclusion to association/descriptive comparison.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
13	B has the higher typical value by 8. A has the smaller IQR and is more consistent. Use “median” and “IQR” explicitly.	**3**	M1 setup; M1 process; A1 conclusion.
14	Neither has the higher mean. Group B has the smaller range by 12 and is more consistent by this measure. Range uses only the two extremes and may be distorted by outliers.	**3**	M1 setup; M1 process; A1 conclusion.
15	Compare proportional/relative frequency density or normalise areas, and use the same class boundaries/scales where possible. Raw bar areas are confounded by sample size.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 08 / S4,S5

Comparing Distributions, Skew and Statistical Conclusions

GRADE 7-9 CHALLENGE - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	The long high-value tail pulls the mean upward, so typically mean>median. The exact relationship depends on the data, but the median is more resistant to the tail.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
2	Mean and range are only two summaries. Data may differ in clustering, gaps, skew, modality, quartiles and outliers while retaining the same total/mean and extremes.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
3	One maximum describes a single extreme and may be an outlier. Compare representative centre (median/mean), spread (IQR/range), sample sizes and distribution shape before concluding.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	Use median and IQR because they resist extreme high incomes. Mean and range would be pulled by outliers and may not represent a typical person.	**3**	M1 setup; M1 process; A1 conclusion.
5	State which group has higher median, which has smaller IQR/range, quantify differences, mention overlap/outliers if shown, use contextual units, and limit the conclusion to association/descriptive comparison.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	B has the higher typical value by 9. A has the smaller IQR and is more consistent. Use “median” and “IQR” explicitly.	**3**	M1 setup; M1 process; A1 conclusion.
7	B has the higher mean by 2. Group B has the smaller range by 10 and is more consistent by this measure. Range uses only the two extremes and may be distorted by outliers.	**3**	M1 setup; M1 process; A1 conclusion.
8	Compare proportional/relative frequency density or normalise areas, and use the same class boundaries/scales where possible. Raw bar areas are confounded by sample size.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
9	The long high-value tail pulls the mean upward, so typically mean>median. The exact relationship depends on the data, but the median is more resistant to the tail.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
10	Mean and range are only two summaries. Data may differ in clustering, gaps, skew, modality, quartiles and outliers while retaining the same total/mean and extremes.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 09 / S1,S2,S4,S5

Missing Data, Corrections, Critique and Statistical Validity

FLUENCY CHECK - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Old total=200. Corrected total=200-30+25=195. Corrected mean=19.5.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
2	Old total=231. New total=(12)(22)=264. x=new-old=33.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
3	[x+2(7)+3(10)]/[x+17]=2. Solve: x+44=2x+34, so x=10.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	The displayed categories are not exhaustive, so percentages/angles may mislead and comparisons are incomplete. Include the omitted category or clearly state and justify exclusions.	**3**	M1 setup; M1 process; A1 conclusion.
5	Non-responders may differ systematically from responders, so weighting only by response count can bias estimates. Use follow-up/contact alternatives, compare known characteristics and apply justified weighting.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	Check target population and sampling frame; selection/non-response bias; measurement/question quality; sample size/random variation. Report uncertainty and do not generalise beyond supported groups.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
7	Each value has a rounding error that can accumulate in the total. The mean of rounded values may differ from the rounded mean of exact values; retain original precision until the final answer.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
8	A large relative percentage may correspond to a tiny absolute change when the baseline is small. Report both baseline and final values, absolute and relative change, sample size and uncertainty.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 09 / S1,S2,S4,S5

Missing Data, Corrections, Critique and Statistical Validity

STANDARD HIGHER • PART A - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Old total=210. Corrected total=210-38+33=205. Corrected mean=20.5.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
2	Old total=242. New total=(12)(23)=276. x=new-old=34.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
3	[x+2(5)+3(12)]/[x+17]=2. Solve: x+46=2x+34, so x=12.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	The displayed categories are not exhaustive, so percentages/angles may mislead and comparisons are incomplete. Include the omitted category or clearly state and justify exclusions.	**3**	M1 setup; M1 process; A1 conclusion.
5	Non-responders may differ systematically from responders, so weighting only by response count can bias estimates. Use follow-up/contact alternatives, compare known characteristics and apply justified weighting.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	Check target population and sampling frame; selection/non-response bias; measurement/question quality; sample size/random variation. Report uncertainty and do not generalise beyond supported groups.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 09 / S1,S2,S4,S5

Missing Data, Corrections, Critique and Statistical Validity

STANDARD HIGHER • PART B - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
7	Each value has a rounding error that can accumulate in the total. The mean of rounded values may differ from the rounded mean of exact values; retain original precision until the final answer.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
8	A large relative percentage may correspond to a tiny absolute change when the baseline is small. Report both baseline and final values, absolute and relative change, sample size and uncertainty.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
9	Old total=220. Corrected total=220-46+41=215. Corrected mean=21.5.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
10	Old total=253. New total=(12)(24)=288. x=new-old=35.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
11	[x+2(8)+3(8)]/[x+16]=2. Solve: x+40=2x+32, so x=8.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
12	The displayed categories are not exhaustive, so percentages/angles may mislead and comparisons are incomplete. Include the omitted category or clearly state and justify exclusions.	**3**	M1 setup; M1 process; A1 conclusion.

MODULE 09 / S1,S2,S4,S5

Missing Data, Corrections, Critique and Statistical Validity

MULTI-STEP HIGHER • PART A - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Non-responders may differ systematically from responders, so weighting only by response count can bias estimates. Use follow-up/contact alternatives, compare known characteristics and apply justified weighting.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
2	Check target population and sampling frame; selection/non-response bias; measurement/question quality; sample size/random variation. Report uncertainty and do not generalise beyond supported groups.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
3	Each value has a rounding error that can accumulate in the total. The mean of rounded values may differ from the rounded mean of exact values; retain original precision until the final answer.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	A large relative percentage may correspond to a tiny absolute change when the baseline is small. Report both baseline and final values, absolute and relative change, sample size and uncertainty.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	Old total=230. Corrected total=230-54+49=225. Corrected mean=22.5.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	Old total=264. New total=(12)(25)=300. x=new-old=36.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
7	[x+2(6)+3(10)]/[x+16]=2. Solve: x+42=2x+32, so x=10.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
8	The displayed categories are not exhaustive, so percentages/angles may mislead and comparisons are incomplete. Include the omitted category or clearly state and justify exclusions.	**3**	M1 setup; M1 process; A1 conclusion.

MODULE 09 / S1,S2,S4,S5

Missing Data, Corrections, Critique and Statistical Validity

MULTI-STEP HIGHER • PART B - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
9	Non-responders may differ systematically from responders, so weighting only by response count can bias estimates. Use follow-up/contact alternatives, compare known characteristics and apply justified weighting.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
10	Check target population and sampling frame; selection/non-response bias; measurement/question quality; sample size/random variation. Report uncertainty and do not generalise beyond supported groups.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
11	Each value has a rounding error that can accumulate in the total. The mean of rounded values may differ from the rounded mean of exact values; retain original precision until the final answer.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
12	A large relative percentage may correspond to a tiny absolute change when the baseline is small. Report both baseline and final values, absolute and relative change, sample size and uncertainty.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
13	Old total=240. Corrected total=240-62+57=235. Corrected mean=23.5.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
14	Old total=275. New total=(12)(26)=312. x=new-old=37.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
15	[x+2(9)+3(12)]/[x+21]=2. Solve: x+54=2x+42, so x=12.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 09 / S1,S2,S4,S5

Missing Data, Corrections, Critique and Statistical Validity

GRADE 7-9 CHALLENGE - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	The displayed categories are not exhaustive, so percentages/angles may mislead and comparisons are incomplete. Include the omitted category or clearly state and justify exclusions.	**3**	M1 setup; M1 process; A1 conclusion.
2	Non-responders may differ systematically from responders, so weighting only by response count can bias estimates. Use follow-up/contact alternatives, compare known characteristics and apply justified weighting.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
3	Check target population and sampling frame; selection/non-response bias; measurement/question quality; sample size/random variation. Report uncertainty and do not generalise beyond supported groups.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	Each value has a rounding error that can accumulate in the total. The mean of rounded values may differ from the rounded mean of exact values; retain original precision until the final answer.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	A large relative percentage may correspond to a tiny absolute change when the baseline is small. Report both baseline and final values, absolute and relative change, sample size and uncertainty.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	Old total=250. Corrected total=250-70+65=245. Corrected mean=24.5.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
7	Old total=286. New total=(12)(27)=324. x=new-old=38.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
8	[x+2(7)+3(8)]/[x+15]=2. Solve: x+38=2x+30, so x=8.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
9	The displayed categories are not exhaustive, so percentages/angles may mislead and comparisons are incomplete. Include the omitted category or clearly state and justify exclusions.	**3**	M1 setup; M1 process; A1 conclusion.
10	Non-responders may differ systematically from responders,	**4**	M1 setup; M1 development; A1

	so weighting only by response count can bias estimates. Use follow-up/contact alternatives, compare known characteristics and apply justified weighting.		accuracy; A1 conclusion.

MODULE 10 / S1-S6 synthesis

Mixed Higher Statistics Problem Solving

FLUENCY CHECK - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Total=1000; proportional calculations are [24.0, 36.0, 40.0]. Largest-remainder allocations are [24, 36, 40], summing to 100. Select randomly within each complete year-group list; this avoids convenience selection within strata.	**5**	M1 setup; M2–M4 development; A1 conclusion.
2	Σfx=379, Σf=20, so mean=379/20=379/20. The transformation is y=2(x+4)=2x+8, so new mean=2(379/20)+8=459/10.	**5**	M1 setup; M2–M4 development; A1 conclusion.
3	Using midpoints [5, 15, 25, 35], Σfx=520 and Σf=28, so estimated mean=520/28=18.571. The median position is 14; cumulative frequencies are [6, 16, 24, 28], so the median class is 10-<20.	**5**	M1 setup; M2–M4 development; A1 conclusion.
4	Density=frequency÷width, giving ['2', '2', '2']. The tallest bar is class 1 with density 2; compare density, not raw frequency.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
5	IQR=42-18=24. By definition, the interval from Q1 to Q3 contains the middle 50%, so approximately 120/2=60 observations. Graph readings and grouped interpolation make this approximate.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	m=(55-25)/(30-10)=3/2 and c=25-(3/2)(10)=10, so y=3/2x+10. At x=20, y=40. Since 10≤20≤30, this is interpolation.	**5**	M1 setup; M2–M4 development; A1 conclusion.
7	Group B has the higher median by 4, so it has the higher typical value. A has the smaller IQR by 6, so A is more consistent. A box plot does not show detailed shape, gaps, modes or sample size.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
8	Recorded total=12×24=288. Corrected total=288-40+32=280. Corrected mean=280/12=70/3. A value was corrected, not added or removed, so n remains 12.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 10 / S1-S6 synthesis

Mixed Higher Statistics Problem Solving

STANDARD HIGHER • PART A - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Increase=58-50=8; percentage increase=(8/50)×100=16.00%. Starting the axis at 48 magnifies the visual rise. The graph should use a clearly justified scale or axis break and report both absolute and percentage changes.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
2	Total=1050; proportional calculations are [27.238, 39.81, 42.952]. Largest-remainder allocations are [27, 40, 43], summing to 110. Select randomly within each complete year-group list; this avoids convenience selection within strata.	**5**	M1 setup; M2–M4 development; A1 conclusion.
3	Σfx=457, Σf=23, so mean=457/23=457/23. The transformation is y=2(x+4)=2x+8, so new mean=2(457/23)+8=1098/23.	**5**	M1 setup; M2–M4 development; A1 conclusion.
4	Using midpoints [5, 15, 25, 35], Σfx=600 and Σf=32, so estimated mean=600/32=18.750. The median position is 16; cumulative frequencies are [7, 18, 27, 32], so the median class is 10-<20.	**5**	M1 setup; M2–M4 development; A1 conclusion.
5	Density=frequency÷width, giving ['3', '5/2', '7/3']. The tallest bar is class 1 with density 3; compare density, not raw frequency.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	IQR=44-19=25. By definition, the interval from Q1 to Q3 contains the middle 50%, so approximately 140/2=70 observations. Graph readings and grouped interpolation make this approximate.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 10 / S1-S6 synthesis

Mixed Higher Statistics Problem Solving

STANDARD HIGHER • PART B - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
7	m=(57-27)/(31-11)=3/2 and c=27-(3/2)(11)=21/2, so y=3/2x+21/2. At x=21, y=42. Since 11≤21≤31, this is interpolation.	**5**	M1 setup; M2–M4 development; A1 conclusion.
8	Group B has the higher median by 3, so it has the higher typical value. A has the smaller IQR by 6, so A is more consistent. A box plot does not show detailed shape, gaps, modes or sample size.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
9	Recorded total=13×25=325. Corrected total=325-41+33=317. Corrected mean=317/13=317/13. A value was corrected, not added or removed, so n remains 13.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
10	Increase=64-55=9; percentage increase=(9/55)×100=16.36%. Starting the axis at 53 magnifies the visual rise. The graph should use a clearly justified scale or axis break and report both absolute and percentage changes.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
11	Total=1100; proportional calculations are [30.545, 43.636, 45.818]. Largest-remainder allocations are [30, 44, 46], summing to 120. Select randomly within each complete year-group list; this avoids convenience selection within strata.	**5**	M1 setup; M2–M4 development; A1 conclusion.
12	Σfx=541, Σf=26, so mean=541/26=541/26. The transformation is y=2(x+4)=2x+8, so new mean=2(541/26)+8=645/13.	**5**	M1 setup; M2–M4 development; A1 conclusion.

MODULE 10 / S1-S6 synthesis

Mixed Higher Statistics Problem Solving

MULTI-STEP HIGHER • PART A - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Using midpoints [5, 15, 25, 35], Σfx=680 and Σf=36, so estimated mean=680/36=18.889. The median position is 18; cumulative frequencies are [8, 20, 30, 36], so the median class is 10-<20.	**5**	M1 setup; M2–M4 development; A1 conclusion.
2	Density=frequency÷width, giving ['4', '3', '8/3']. The tallest bar is class 1 with density 4; compare density, not raw frequency.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
3	IQR=46-20=26. By definition, the interval from Q1 to Q3 contains the middle 50%, so approximately 160/2=80 observations. Graph readings and grouped interpolation make this approximate.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
4	m=(59-29)/(32-12)=3/2 and c=29-(3/2)(12)=11, so y=3/2x+11. At x=22, y=44. Since 12≤22≤32, this is interpolation.	**5**	M1 setup; M2–M4 development; A1 conclusion.
5	Group B has the higher median by 2, so it has the higher typical value. A has the smaller IQR by 6, so A is more consistent. A box plot does not show detailed shape, gaps, modes or sample size.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	Recorded total=14×26=364. Corrected total=364-42+34=356. Corrected mean=356/14=178/7. A value was corrected, not added or removed, so n remains 14.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
7	Increase=70-60=10; percentage increase=(10/60)×100=16.67%. Starting the axis at 58 magnifies the visual rise. The graph should use a clearly justified scale or axis break and report both absolute and percentage changes.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
8	Total=1150; proportional calculations are [33.913, 47.478, 48.609]. Largest-remainder allocations are [34, 47, 49], summing to 130. Select randomly within each complete year-group list; this avoids convenience selection within strata.	**5**	M1 setup; M2–M4 development; A1 conclusion.

MODULE 10 / S1-S6 synthesis

Mixed Higher Statistics Problem Solving

MULTI-STEP HIGHER • PART B - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
9	Σfx=631, Σf=29, so mean=631/29=631/29. The transformation is y=2(x+4)=2x+8, so new mean=2(631/29)+8=1494/29.	**5**	M1 setup; M2–M4 development; A1 conclusion.
10	Using midpoints [5, 15, 25, 35], Σfx=760 and Σf=40, so estimated mean=760/40=19.000. The median position is 20; cumulative frequencies are [9, 22, 33, 40], so the median class is 10-<20.	**5**	M1 setup; M2–M4 development; A1 conclusion.
11	Density=frequency÷width, giving ['5', '7/2', '3']. The tallest bar is class 1 with density 5; compare density, not raw frequency.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
12	IQR=48-21=27. By definition, the interval from Q1 to Q3 contains the middle 50%, so approximately 180/2=90 observations. Graph readings and grouped interpolation make this approximate.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
13	m=(61-31)/(33-13)=3/2 and c=31-(3/2)(13)=23/2, so y=3/2x+23/2. At x=23, y=46. Since 13≤23≤33, this is interpolation.	**5**	M1 setup; M2–M4 development; A1 conclusion.
14	Group B has the higher median by 1, so it has the higher typical value. A has the smaller IQR by 6, so A is more consistent. A box plot does not show detailed shape, gaps, modes or sample size.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
15	Recorded total=15×27=405. Corrected total=405-43+35=397. Corrected mean=397/15=397/15. A value was corrected, not added or removed, so n remains 15.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

MODULE 10 / S1-S6 synthesis

Mixed Higher Statistics Problem Solving

GRADE 7-9 CHALLENGE - ANSWERS

HIGHER TIER • SHOW CLEAR WORKING • KEEP EXACT VALUES WHERE REQUIRED

Name: _____ Date: _____ Score: _____ / _____

Use the formula/method guides in the consolidated solutions section. Award method marks where the setup is correct.

Q	Answer / concise method	Marks	Check
1	Increase=76-65=11; percentage increase=(11/65)×100=16.92%. Starting the axis at 63 magnifies the visual rise. The graph should use a clearly justified scale or axis break and report both absolute and percentage changes.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
2	Total=1200; proportional calculations are [37.333, 51.333, 51.333]. Largest-remainder allocations are [38, 51, 51], summing to 140. Select randomly within each complete year-group list; this avoids convenience selection within strata.	**5**	M1 setup; M2–M4 development; A1 conclusion.
3	Σfx=727, Σf=32, so mean=727/32=727/32. The transformation is y=2(x+4)=2x+8, so new mean=2(727/32)+8=855/16.	**5**	M1 setup; M2–M4 development; A1 conclusion.
4	Using midpoints [5, 15, 25, 35], Σfx=840 and Σf=44, so estimated mean=840/44=19.091. The median position is 22; cumulative frequencies are [10, 24, 36, 44], so the median class is 10-<20.	**5**	M1 setup; M2–M4 development; A1 conclusion.
5	Density=frequency÷width, giving ['6', '4', '10/3']. The tallest bar is class 1 with density 6; compare density, not raw frequency.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
6	IQR=50-22=28. By definition, the interval from Q1 to Q3 contains the middle 50%, so approximately 200/2=100 observations. Graph readings and grouped interpolation make this approximate.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
7	m=(63-33)/(34-14)=3/2 and c=33-(3/2)(14)=12, so y=3/2x+12. At x=24, y=48. Since 14≤24≤34, this is interpolation.	**5**	M1 setup; M2–M4 development; A1 conclusion.
8	Both groups have the same median of 48, so neither has a higher typical value by this measure. A has the smaller IQR by 6, so A is more consistent. A box plot does not show detailed shape, gaps, modes or sample size.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.
9	Recorded total=16×28=448. Corrected total=448-44+36=440. Corrected mean=440/16=55/2. A value was corrected, not added or removed, so n remains 16.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.

10	Increase=82-70=12; percentage increase=(12/70)×100=17.14%. Starting the axis at 68 magnifies the visual rise. The graph should use a clearly justified scale or axis break and report both absolute and percentage changes.	**4**	M1 setup; M1 development; A1 accuracy; A1 conclusion.